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Final Engineering Report

Mariner C - 64

Trapped Radiation Detector, Unit 25

JPL/University of Iowa Contract 950613

under NAS 7-100

19 February 1965

Prepared by
Department of Physics and Astronomy
University of Iowa
Iowa City, Iowa

for

Jet Propulsion Laboratory
4800 Oak Grove Drive
Pasadena, California

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1.5 163

Prepared by:

R. H. Gabel 20 Feb 65
R. H. Gabel, Project Coordinator

J. F. Skerik 20 Feb. 1965
J. Skerik, Project Administrator

Submitted:

D. L. Chinburg 20 February 1965
D. L. Chinburg, Project Manager

Approved:

J. A. Van Allen 22 February 1965
J. A. Van Allen,
Principal Investigator

1. Summary

1.1 Object of Report. The object of this report is to provide a concise technical description of the Mariner C program at the University of Iowa under JPL/University of Iowa Contract 950613, 17 May 1963 through 30 December 1964.

1.2 Scope of Work

1.2.1 Experiment Models. Design, fabricate, test, and deliver the following models of a Trapped Radiation Experiment:

- a. 1 Engineering Prototype/Type Approval (EP/TA) Model.
- b. 1 Proof Test Model (PTM/MC-1).
- c. 3 Flight Models (MC-2, MC-3, MC-4).
- d. 1 Set of Spare Parts (MC-5).

1.2.2 Bench Checkout Equipment. Design, fabricate, test, and deliver three sets of Bench Checkout Equipment (BCE) for the above experiment.

1.2.3 Services

- a. Establish engineering liaison with JPL.
- b. Furnish qualified personnel to perform engineering services at JPL and at ETR as required.

1.2.4 Documentation. Provide detailed technical and financial documentation for the project.

1.3 Results. The U of I MC-2 experiment was launched aboard the MC-2 spacecraft (Mariner-3) on 5 November 1964. The mission was unsuccessful although the U of I experiment operated properly. MC-3 was launched aboard the MC-3 spacecraft (Mariner-4) on 28 November 1964. It has operated properly through 19 February 1965.

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5. General Description

- 5.1 Mission Objectives. The University of Iowa Mariner C Trapped Radiation Experiment (Unit 25) is an array of particle detectors designed to search for and to measure any belts of trapped radiation possessed by Mars and to measure interplanetary cosmic rays while en route to Mars. These measurements will include flux, energy, directional characteristics, and identities of the particles.
- 5.2 General. In accordance with JPL/U of I contract 950613, the University of Iowa designed, constructed, tested, and delivered the following units and documentation:
- 5.2.1 Thermal Control Model (TCM). This unit consisted of a subchassis containing dummy detectors and no electronics. The mass and size of the TCM were a close approximation of the subsequent flight units. The TCM was tested by JPL to determine the inherent thermal properties of unit 25 and to devise passive means of thermal control for the flight units.
- 5.2.2 Engineering Prototype/Type Approval (EP/TA). The EP/TA model was constructed as a fully operational unit except it possessed no means of thermal control. The instrument was subjected to, and passed the entire battery of environmental tests as called out in JPL EPD-59, specification number 30250 B.
- 5.2.3 Proof Test Model (MC-1). The PTM was the first flight quality instrument constructed. It was subjected to flight acceptance environmental tests (see EPD-59, Specification 30251 B). It was then used for integration and spacecraft testing.
- 5.2.4 First Flight Unit (MC-2). This was the first flight unit. The unit was launched aboard the MC-2 spacecraft (Mariner 3) on 5 November 1964. The mission was unsuccessful although the SUI experiment apparently operated properly.
- 5.2.5 Second Flight Unit (MC-3). MC-3, unit 25 was launched aboard the MC-3 spacecraft on 28 November 1964. It has operated properly through 19 February 1965.

- 5.2.6 Flight Spare MC-4. This instrument was intended to be used as a back up unit for flight units MC-2 and MC-3.
- 5.2.7 MC-5. This was an assemblage of spare sub-systems and components of unit 25.
- 5.2.8 Bench Checkout Equipment (BCE). Three complete sets were designed, constructed, assembled, and tested. The first two sets were delivered to JPL for bench testing of unit 25. The remaining unit was retained at the University of Iowa. Checkout sources were provided for EP/TA, MC-1, 2, 3, 4, 5.
- 5.2.9 Documentation
- a. Functional Specifications.
 - b. Environmental Test Specifications.
 - c. Design Specifications.
 - d. Detail Drawings.
 - e. Materials Lists.
 - f. Flow Plans.
 - g. Equipment Certification Data for Each Instrument.
 - h. Quality Assurance Plan.
 - i. Quality Control Plan.
 - j. Electronic Components Parts List.
 - k. Failure Reports as Necessary.
 - l. Monthly Technical Reports.
 - m. Monthly Financial Reports.
 - n. Final Engineering Report.

5.3 Weight. The total weight of this experiment: ~2.15 pounds.

5.4 Power. Power required: ~380 milliwatts (supplied as a 2400 cps square wave).

5.5 Location on Spacecraft. The University of Iowa Mariner C Trapped Radiation Experiment was mounted on the Mariner C spacecraft in Section IV as is shown on JPL drawing number 4190502.

5.6 Configuration. The configuration of the experiment is a rectangular box 5" by 5.5" by 3". All of the particle detectors are mounted on one surface of this box and all of the subsystems contained inside (see University of Iowa drawing number 33-1003-C).

5.6.1 Detector View Angles

- a. Detector A: This detector has an unshielded window and a full view angle of 60° directed 135° from the probe-sun line. There are no obstructions in its field of view.
- b. Detector B: This detector has an unshielded window and a full view angle of 60° , directed 70° from the probe-sun line. There are no obstructions in its field of view.
- c. Detector C: This detector has a window shielded by approximately 20 mg/cm^2 of aluminum. View angle and direction are identical to Detector B.
- d. Detector D: View angle and direction are identical to Detector B.

6. Particle Detectors

- 6.1 Geiger Mueller Counters. Detectors A, B, and C are type 6213 mica end window GM counters made by the Eon Corporation. Their energy threshold is nominally 40 keV for electrons and 500 keV for protons. The 6213 measures the total number of charged particles passing through its sensitive volume. The sensitive volume of each tube is shielded such that particles of low and moderate energies may only enter through the window. Much higher energy particles may enter from other directions. By allowing for the omnidirectional flux of high energy particles a directional measurement of the low energy particles is obtained.
- 6.1.1 Apertures. The diameter of the aperture of Detectors A, B, and C is 0.120 inches. Since the 6213 tube will count hard ultraviolet photons, each aperture is shaded from the sun by making the entrance corridor a 60° oblique truncated cone. The result is analogous to the visor on a cap (drawing number C35-0014C). Behind the aperture on Detector C is approximately 20 mg/cm² (~ 0.0025 in.) of aluminum. This serves to increase the threshold energy to 130 keV for electrons and 3 MeV for protons. Detectors A and B have no foil shields and are 40 keV/500 keV tubes.
- 6.2 PN Junction Detector (Silicon Surface-Barrier Diode). The solid state detector (Detector D) is a two-channel proton spectrometer. The detector and all of its associated electronics are enclosed in a gold plated RF tight box (University of Iowa drawing number D37-1001).
- 6.2.1 Intended Objectives. Detector D measures flux and energy of protons and alpha particles within specific energy ranges while being essentially insensitive to electrons of all energies. It also makes possible the differentiation between the electrons and protons counted by the GM counters.

6.2.1.1 Functional Specifications. The full look angle of Detector D is 60° and the area is between $7-8 \text{ mm}^2$; hence the geometric factor of the detector is about 0.06 cm^2 steradian.

The energy discrimination levels are:
Channel D1, 500 keV and 11 MeV;
Channel D2, 880 keV and 4 MeV.

Detector D contains an on-board Am 241 radioactive source of low intensity ($< 0.01 \mu \text{ C}$) to establish background counting rates. For Channel D1, this rate is 3 to 4 counts per minute, and for Channel D2, it is 2 to 3 counts per minute.

The maximum counting rates of Channels D1 and D2 are about 35,000-41,000 counts per second.

6.2.2 Electron Sensitivity. The sensitivity to electrons of the detector is minimized (almost to zero) by three factors. First, the detector is too thin to absorb much energy from electrons. Second, the discrimination level is set much higher than the expected electron energy loss. Third, the pulses are clipped very short so as to avoid pile up of low energy electrons.

6.2.3 Detector Grounding Problem and Solution.

Early in the project, after the first few silicon surface barrier detectors were delivered to the University of Iowa, it became apparent under microscopic examination that the ground contact of the detector was not exceptionally good. The detectors on hand were selected on the basis of the appearance of a physically sound ground contact and the manufacturer was notified of the problem which he promised to correct.

However, the detector in MC-4, although apparently well grounded, failed at JPL. The failure was traced to the broken ground contact. This failure raised doubt as to the quality of the contacts on MC-2 and MC-3.

A conducting epoxy, Eccobond 56C (Emerson Cumming) was successfully used to adequately secure the ground connection on some sample detectors. The electrical characteristics of these detectors were equal to or better than they were originally. A few detectors did become noisy but seemed to "heal themselves" as time passed. Type-approval vibration tests were used in addition to a number of temperature cycles to test the permanence of the ground contact. There were no failures after being properly treated in this fashion.

The flight detectors for MC-2, MC-3, and MC-4 were all restored with this epoxy.

Although it was impossible to duplicate the intermittent ground and thus investigate the behavior of the detector, it appeared that the following is a possible sequence of events:

(1) The ground contact was "half broken" in such a way that a very high resistance and capacitance appeared across the input of the charge sensitive preamplifier with the result that the amplifiers were driven into oscillation (output counting rates up to 40,000 c/s).

(2) If the break in the ground contact was more or less "clean", i.e., open, the detector was not grounded at all. The pulses at the input of the preamplifier were greatly diminished so that the counting rate dropped to zero.

The above sequence of events fit well with the observed failure of MC-4. First a very high counting rate occurred, then a zero counting rate occurred. The diminished pulse-heights were observed at the output of the amplifiers.

Although the alleged failure of MC-2 was not duplicated on the bench, the data through the spacecraft system could be explained by reference to (2) above.

There were no further troubles of this nature.

7. Electronics

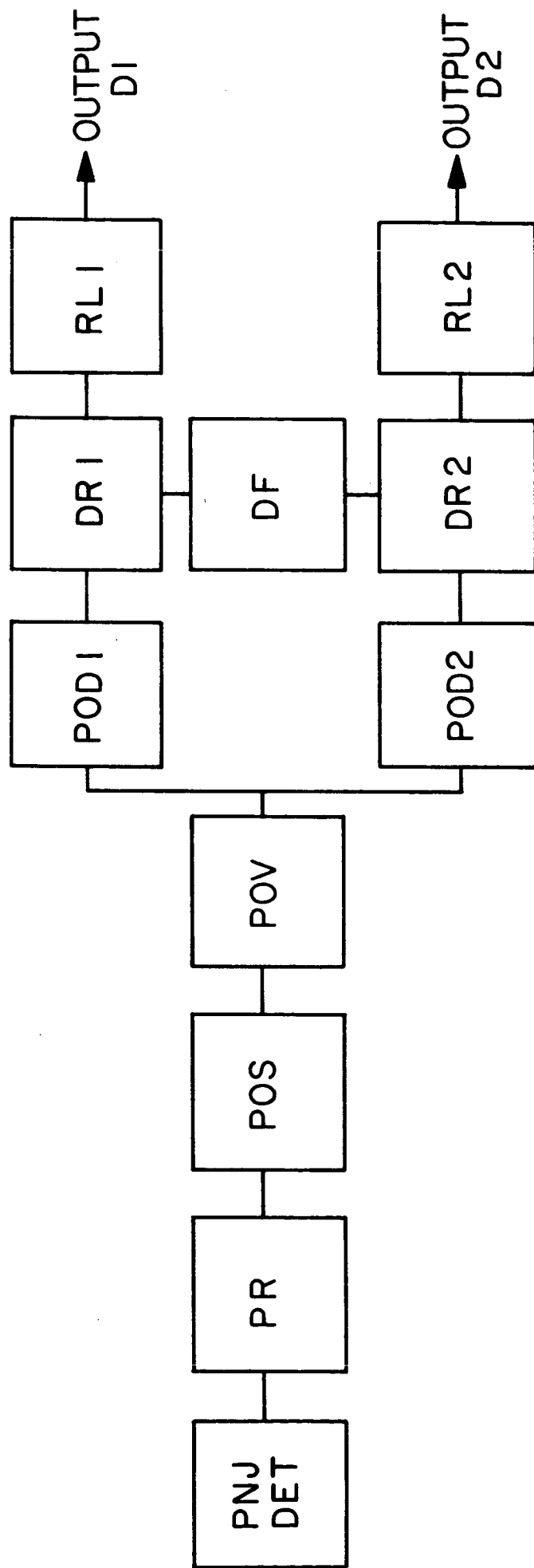
7.1 GM Preamplifiers. The output pulses from each of the GM counters is sent to one of the amplifiers. Each amplifier is a complementary NPN-PNP saturating device which shapes and conditions the GM pulses to meet the DAS interface requirements. These amplifiers were designed, fabricated, and tested by the University of Iowa (Drawing C33-3001).

7.2 PN Junction Detector Electronics. The overall operation of the detector, from data generation to data conditioning, may be understood by referring to Figure 1. All design, fabrication, and testing of these circuits was done by the University of Iowa (Drawing C37-2006).

7.2.1 Preamplifier. A charged particle entering a solid state detector will release a number of electrons proportional to the energy of the particle which is lost in the detector. Taking this amount of charge into consideration along with the detector capacitance, a corresponding voltage pulse will occur at the output. The capacitance of a solid state detector varies when the detector pulse varies. However, charge released by the particle does not change with capacitance. This makes the charge sensitive amplifier a great deal more desirable than a voltage amplifier [Fillius, 1963] (Drawing C37-3005).

7.2.2 Post Amplifiers. The post amplifiers of this instrument are highly stable negative feedback voltage amplifiers. They receive pulses from the preamplifiers, amplify them, and send them to the discriminators. The overall gain of each string of post amplifiers is adjusted so as to give voltage pulses at the discriminators of levels corresponding to the particles detected (Drawing 37-3007).

7.2.3 Discriminators. These circuits are based on temperature stabilized voltage discriminators which accept voltage pulses above a pre-set level (> 1.4 volts). All pulses under this value are rejected (Drawing 37-3004).



PR = PREAMPLIFIER
 POS = POSTAMPLIFIER
 POV = POSTAMP (VARIABLE GAIN 4-20)
 POD1 = POSTAMP CHANNEL D1
 POD2 = " " D2
 DR1 = DISCRIMINATOR CHANNEL D1
 DR2 = " " D2
 RL1 = RATE LIMITER D1
 RL2 = " " D2
 DF = DISCRIMINATOR REFERENCE PACK

FIGURE 1

- 7.2.4 Output and Rate Limiter. This circuit is based on a monostable multi-vibrator. It receives the data from the discriminators and serves to limit the maximum counting rates below 50,000 c/sec. Also incorporated are circuits which standardize the pulses to meet the Spacecraft Data Automation System (DAS) interface requirements (Drawing 37-3003).

8. Power Supply

The Unit 25 power supply was designed, fabricated, and tested by the Matrix Corporation of Nashua, New Hampshire to the University of Iowa and JPL specifications.

8.1 Configuration. The power supply was packaged such that all components were mounted on two, back-to-back, single sided printed circuit boards 2.75 inches by 3.50 inches. After the testing phase each power supply was potted, then foamed, which resulted in a vertical dimension of 1.50 inches. Weight before potting = 193 grams. Weight after potting = 282 grams. (Drawing C33-1002)

8.2 Input. The unit 25 power supply was driven by the space-craft power system as follows:

Frequency: 2400 cps square wave

Voltage: 50 v rms \pm 2%

Rise Time: 5 \pm 4 μ sec

Experiment Power

Requirement: 400 milliwatts

8.2.1 Input Limiter. Incorporated in the design is a current limiter which limits the input current to below 400% of normal full load input current.

8.2.2 Fusing. The unit is also protected by a pair of 50 ma fuses, in parallel, inserted in the 50 VAC input. Since these fuses were installed late in the program they are not inside the power supply itself but on the back of the subchassis near the power connector (Drawing E33-1003-C).

8.3 Outputs

8.3.1 High Voltage Section. The high voltage section was designed to the following specifications:

Voltage: 900-1000 VDC unregulated

Current: 100 μ a constant load

Ripple: 100 mV peak to peak maximum

This voltage served as the input to the corona regulator tubes.

8.3.1.1 Corona Discharge Tubes. Corona regulators (VR tubes) were selected such that their operating voltage matched that of its associated GM counter. These regulator tubes and the entire high voltage section were potted in Eccosil silicone rubber prior to foaming the power supply with Eccofoam.

8.3.2 Detector D Bias Supply

Voltage: +75 VDC \pm 1%

Current: 50 μ a

Ripple: < 1 mV high frequency

8.3.3 Circuit Supply

Voltage: + 8 VDC at 15 ma (set within \pm 0.2 V)

Current: 25 ma maximum

Ripple: < 2 mV

8.4 Corona Regulator Tube Pulsing Problem. Quite late in the project, certain anomalies were discovered in the data of MC-4 at low temperatures. The counting rates were high which is contrary to normal low temperature operation, i.e., low counting rates. It was discovered that the VR tubes were putting out pulses whenever their associated GM counter counted rapidly. A plausible explanation is this: Whenever the GM counter counts rapidly, the VR tube sees a burst of current pulses demanded by the GM tube driving the voltage below the regulating point. This triggers the VR tube into a regenerative region and the anode rapidly drops (< 1 μ sec) to near zero volts before it can recover. The best solution found to this problem is to connect a capacitor across the VR tube. This capacitor serves to supply the current pulses required without an appreciable drop in voltage.

This corrective measure was taken in MC-4 but not in any of the other units.

9. Mechanical Design

- 9.1 Experiment Subchassis. The experiment subchassis was machined from cold-rolled magnesium alloy AZ-31B-H24. The box is divided into an upper and a lower compartment by a bulkhead to which are affixed most of the sub-systems and components (Drawing E33-0001E). The subchassis for the TCM and the EP/TA were built by the University of Iowa. The subchassis for MC-1, 2, 3, 4, and 5 were built by the New Era Industries Company, Cedar Rapids, Iowa.

An error in the location of the mounting holes in the feet of the MC-1, 2, 3, and 4 subchassis was corrected by the following method: The holes which were improperly located were drilled and tapped to 5/16-24 NF thread. A threaded plug of magnesium was screwed into the holes. A small hole was then drilled lengthwise down through the threads and a pin inserted into this hole to secure the plug in the hole. The mounting holes were then redrilled in the correct location.

- 9.2 PN Junction Structure. The PN junction structure and covers were machined from cold rolled magnesium alloy ZA-31B-H24. The top and bottom covers are removable and are shielded against radio frequency interference by money-metal "rope" gaskets.
- 9.3 Detector Housings, Structural Components, and Special Hardware. Detector housings and structural components were fabricated from cold rolled magnesium alloy AZ-31B-H24. The PN junction aperture was fabricated from non-magnetic brass. Special screws were fabricated from non-magnetic brass and non-magnetic stainless steel. See drawings for construction details. Standard screws were of titanium, furnished by JPL.
- 9.4 Surface Treatment. The subchassis for the TCM and EP/TA experiments were surface treated with Dow 7 dichromate at the University of Iowa. The subchassis for the MC-1, 2, 3, 4, and 5 models were treated with grit blast and dichromate per JPL specification 90433.

The PN junction structure was gold plated to provide good conduction between covers and structure and thus provide protection against RF interference.

Grit blasting, dichromating, and gold plating of MC-1, 2, 3, 4, and 5 components were done by Anchor Plating and Tinning Co., South El Monte, California.

GM tube housings on TCM and EP/TA were treated with Dow 7 dichromate and later gold plated. Those on MC-1, 2, 3, 4, and 5 were gold plated without the dichromate. Bores of the tube housings were treated with Dow 19.

- 9.4.1 Gold Plating. Early in the program it was discovered that pin holes were appearing in almost all gold plated magnesium surfaces. Microscopic examination indicated that copper or silver sub-plating was "bleeding" through the gold exposing the under surface to the atmosphere. These surfaces were replated, still maintaining the 0.0005" minimum of copper and 0.0005" minimum of silver but increasing the gold to 0.0003". (JPL specifications originally called for 0.0001".) No further trouble of this nature occurred.

10. Thermal Design

- 10.1 General Information. Unit 25 was located on the upper ring of the spacecraft octagon section and slaved to its temperature. The spacecraft thermal shell was shaped such that the ends of the four detectors and the outboard face of the experiment were exposed to space. The outboard face of the chassis was painted with white paint (PV-100) to achieve the desired temperature range of approximately 100°F near earth and 50° F near Mars.

The GM tube housing and PN junction aperture on MC-1, 2, 3, and 4 were gold plated. Indium foil was used between the GM tube housings and the subchassis to improve thermal conductivity on MC-2, 3, and 4.

The bottom half of the PNJ aperture was painted white in order to lower the temperature of this detector to about 82° F near earth and 37° F near Mars.

Thermal design was performed by Jet Propulsion Laboratory.

- 10.2. Temperature Transducer. A temperature transducer (TS1 T4086S1) was provided by JPL and installed in each experiment at the University of Iowa. Identification of the transducers installed in various units are given in Table I.

<u>Table I</u>	
<u>Experiment</u>	<u>Transducer Serial Number</u>
EP/TA	41873
MC-1	41872
MC-2	41871
MC-3	41870
MC-4	41869

- 10.3 Temperature Control Model (TCM). A temperature control model was delivered to JPL for use in the thermal design of the spacecraft and the SUI experiment. The TCM was similar to the flight models in weight and configuration but contained no electronic subassemblies.

11. Bench Checkout Equipment (BCE)

- 11.1 Description. The bench checkout equipment (BCE) for the University of Iowa Mariner C experiment was especially simple since no timing signals were required to operate it. All detectors are operating whenever power is applied.

The BCE consists of a Glentronics, Inc., AC power supply to simulate the spacecraft power system, a Beckman electronic counter to count detector output pulses, a Tektronix oscilloscope to monitor the electrical properties of those pulses, a Beckman printer to record permanently the counter output, and a push button assembly to select the desired detector output. Only one detector was monitored at a time.

This equipment was mounted in a standard 19-inch rack (see II-20).

12. Quality Assurance and Control

Quality assurance and control was provided by adherence to appropriate U of I and JPL specifications listed in Section 14 of this report. Screened electronic components were provided by JPL. These components were used in MC-2, 3, 4, and 5. Components, unscreened by JPL, but tested in accordance with normal U of I practice were used in EP/TA and MC-1.

University of Iowa and JPL inspectors performed in-process and final inspections on all modules, sub-assemblies and completed experiments.

12.1 Visual Inspection and Temperature Tests. Testing of the University of Iowa Mariner C experiment was done at various stages of fabrication as shown below:

- a. Component: Visual and microscopic inspection of all components in accordance with applicable U of I and JPL specifications.
- b. Module: Visual and microscopic inspection. Preliminary electrical tests over temperature range of -20°C to $+65^{\circ}\text{C}$ before and after conformal coating.
- c. Subassembly: Visual and microscopic inspection. Electrical tests over temperature range of -20°C to $+65^{\circ}\text{C}$.
- d. Experiment: Visual inspection. Electrical check --all detectors, all counting rates.
Temperature test: -10°C to $+50^{\circ}\text{C}$ operating
 -30°C to $+60^{\circ}\text{C}$ survival.

12.2 Vibration Testing. Vibration testing was performed at the University of Iowa, according to JPL Specifications 30250B and 30251B, on each experiment before being delivered to JPL.

In the event any module had to be replaced, a second vibration test was performed. This test was run to the same g-levels but of time duration one-half of that called for in the JPL Specification.

13. Experiment Information and Test Data

13.1 Weight and Power of Specific Experiments.

Listed in Table II is weight and power information concerning each experiment (measured at JPL by D. Schofield of JPL).

<u>Table II</u>		
<u>Experiment</u>	<u>Weight (lbs.)</u>	<u>Power (watts)</u>
EP/TA	2.10	0.36
MC-1	2.34	0.38
MC-2	2.13	0.38
MC-3	2.20	0.35
MC-4	2.15	0.36

13.2 Test Sources and Expected Counting Rates.

Sources and expected counting rates of the experiments with their assigned sources in standard source holders are given in Table III. The sources used were as follows:

GM Checkout---Co 60; ~ 200 μ C; 1.3 MeV γ

PNJ Checkout--Po210; < 10 μ C; 5.5 MeV α , 0.6 MeV γ

Table III

Experiment	GM Source		PNJ Source		Date of Data Run	Expected Counting Rates (Counts/Second)				
	S/N	μ C	S/N	μ C		A	B	C	D1	D2
EP/TA*	C-62	223	Unmarked	< 10	July 64	6.1	54.7	21.7	80.4	80.3
MC-1*	C-68	206	3	< 10	Aug. 64	9.8	156.5	43.9	45** 7.3	43** 6.5
MC-2	C-69	190	2	< 10	April 64	12.1+1.2	161+8.	64.4+1.9	77.3+7	78.3+7
MC-3	C-70	185	7	< 10	May 64	12.1+2.5	56.8+5***	153.1+8***	50.0+5.6	49.1+5.6
MC-4	C-71	190	8	< 10	June 64	9.5+1.5	145+7	54.8+3.5	49.6+5.5	48.7+5.5

* EP/TA and MC-1 counting rates measured at JPL at times indicated. All other counting rates measured at the University of Iowa.

** The PNJ detector was replaced in April 1964 with one of smaller area. The higher counting rates occurred prior to April 1964.

*** Detectors B and C were physically interchanged on MC-3. They are electrically identical to all other units. The source normally is placed on the "middle" GM tube and thus the difference in counting rates.

14. List of Applicable Documents

14.1 University of Iowa Documents

- a. Proposed Experiment for Mariner C 1964 Missions
March 4, 1963.
- b. Mariner C-64 Functional Specifications for Trapped
Radiation Detector--Unit 25
20 June 1963 including Amendment I of 12 September
1963.
- c. Design Specification Mariner C-64 Trapped Radiation
Detector, Unit 25
30 August 1963 including Amendment 1 of 12 August
1964.
- d. Test Specification Mariner C-64 Trapped Radiation
Detector, Unit 25
12 August 1963.
Amendment to this specification of 24 December 1963
was later rescinded.
- e. Mariner Mars 64 Parts List
24 February 1964
Including Mariner C-64 Power Supply Parts List
(Matrix Corporation).
- f. Mariner C-64 List of Drawings Rev. C
3 September 1963.
- g. Quality Control Requirements for Mariner C-64
Experiment
26 September 1963.

14.2 Jet Propulsion Laboratory Documents

- a. Procedures and Requirements for Scientific Instru-
ments, Mariner Mars-64, EPD-59.
- b. JPL Spec. 30250B, Environmental Specification,
Mariner C Flight Equipment, Type Approval Environ-
mental Test Procedures (Assembly Level).
- c. JPL Spec. 30251B, Environmental Specification,
Mariner C Flight Equipment, Flight Acceptance
Environmental Test Procedures and Preacceptance
Test Limits (Assembly Level).

15. Project Personnel

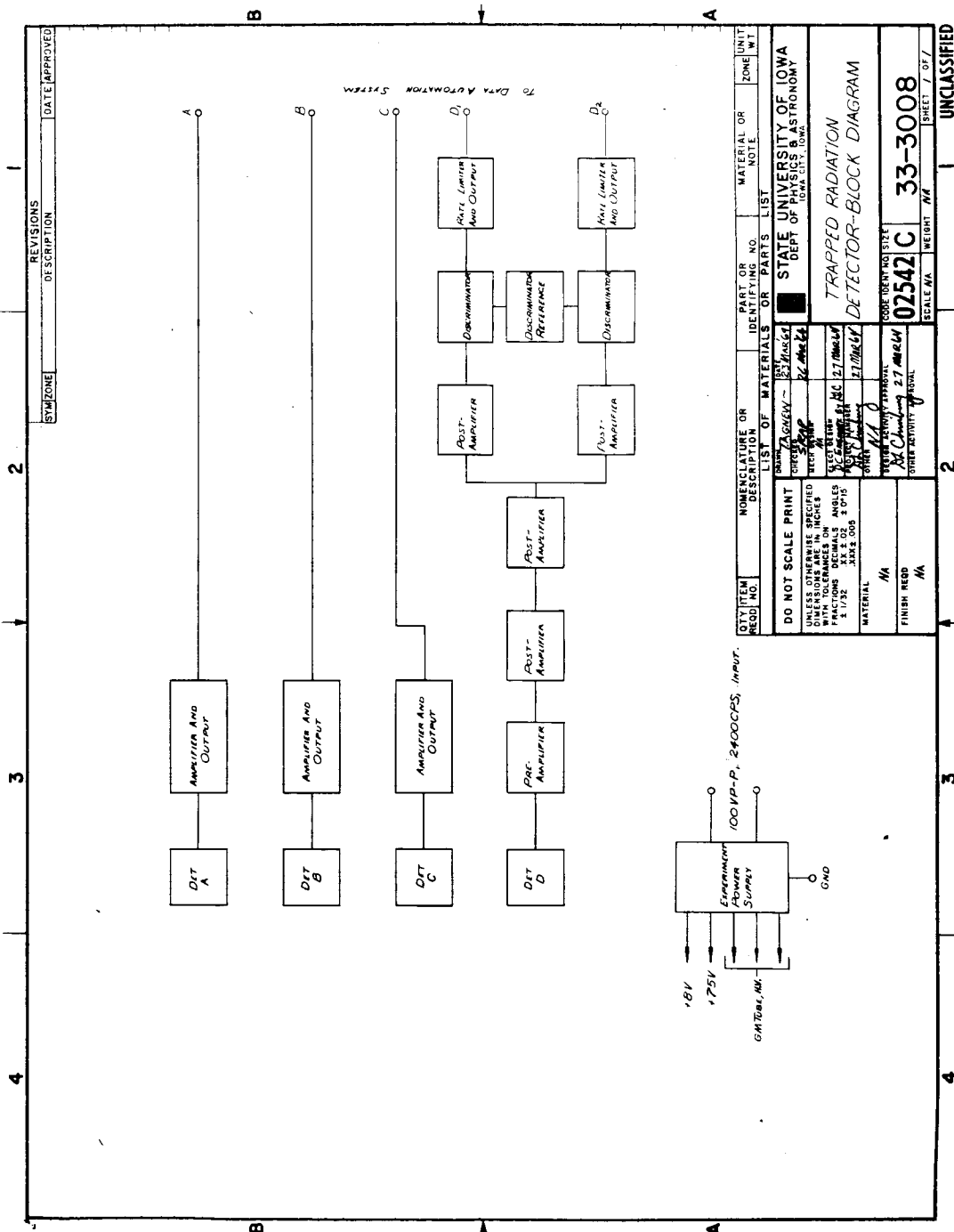
University of Iowa personnel directly involved in the conception, planning, design, fabrication, testing, and delivery of this experiment are as follows:

J. A. Van Allen	Principal Investigator	General director of the project.
T. Armstrong	Experimenter	PNJ detectors: testing, calibration, and field support.
D. L. Chinburg	Project Manager	Responsible for overall conduct of the project.
J. D. Craven	NASA Trainee	GM detectors: testing, calibration, and delivery.
G. Crossett	Designer	Packaging designs and layouts of electronic circuitry.
D. C. Enemark	Senior Design Engineer	Responsible for design of all detector electronics. Supervised all electronics, fabrication, and testing.
L. A. Frank	Co-Investigator	Responsible for scientific design criteria for GM detectors; procurement, testing, calibrating, and delivery of GM detectors.
E. A. Freund	Instrument Shop Supervisor	Responsible for all local fabrication of mechanical parts.
R. H. Gabel	Project Coordinator	Performed detailed coordination of design, fabrication, testing, delivery, and field support of the Mariner experiment.
R. A. Ganfield	Technician	PNJ testing and calibration, BCE fabrication.
J. S. Hathaway	Technician	Responsible for the quality control of the project.

N. K. Henderson	Technician	Testing, calibration, delivery, and field support of GM detectors.
H. K. Hills	NASA Trainee	GM detector and associated voltage regulator tube procurement, testing, calibration, delivery, and field support.
F. Kolpin	Technician	Assistant to the Project Manager.
S. Krimigis	Co-Investigator	Responsible for scientific design criteria for PN junction detector and associated electronics. Procurement, testing, calibrating, and field support of PNJ detectors.
E. Lawrence	Mechanical Designer	Responsible for design, fabrication, and finishing of mechanical parts, and preparation of all finished drawings.
M. Murphy	Electronics Shop Supervisor	Responsible for assembly of all electronics modules and harnessing of the experiments.
S. R. A. Robinson	Mechanical Engineer	Responsible for general design, vibration analysis, and testing of the experiment.
M. Schug	Technician	Assistant to the Project Coordinator.
T. Schweitzer	Technician	Project quality control.
J. F. Skerik	Project Administrator	Assistant to Project Manager.
W. Stanley	Technician	Project quality control, testing, and field support.
E. W. Strein	Technician	Construction and testing of PNJ detectors; packaging design of PNJ electronics; supervised design and construction of the BCE.
R. Wenman	Electronics Shop Technician	Assembly of electronics modules and harnessing of the experiments.

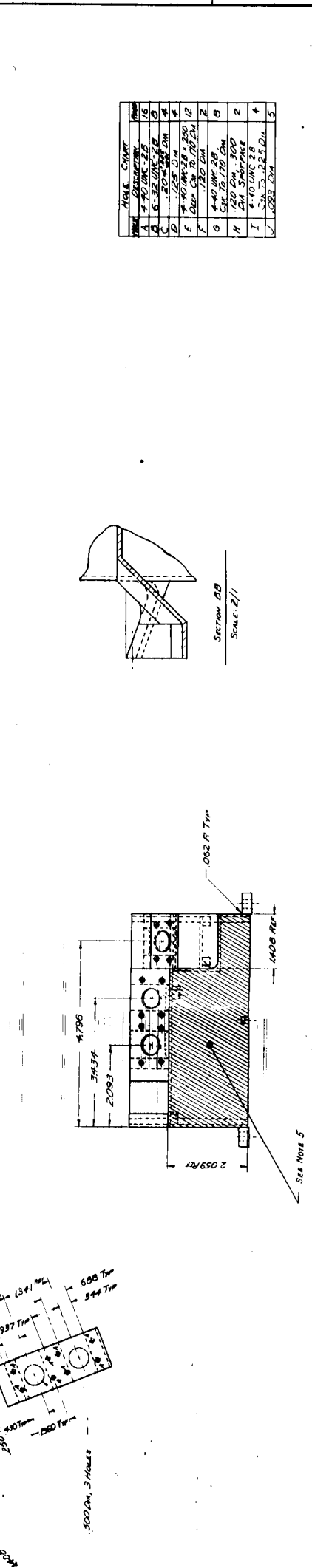
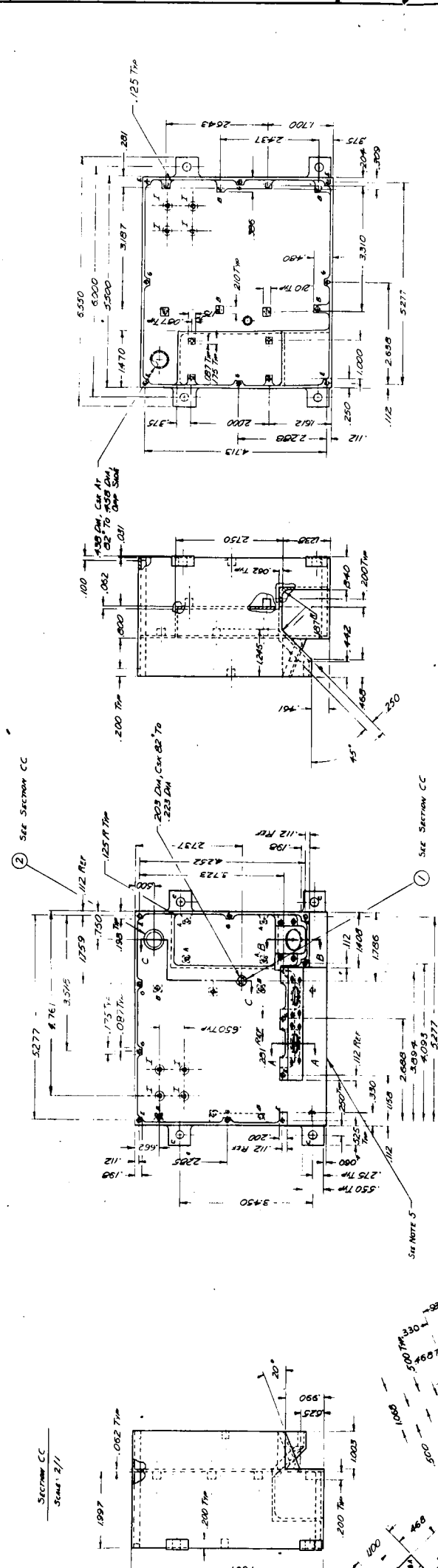
Appendix I

D R A W I N G S



UNCLASSIFIED

REVISIONS		DATE	BY	APPROVED
A	General Dimensions	1-5-54	WJ	
B	General Dimensions	1-5-54	WJ	
C	General Dimensions	1-5-54	WJ	
D	General Dimensions	1-5-54	WJ	
E	General Dimensions	1-5-54	WJ	

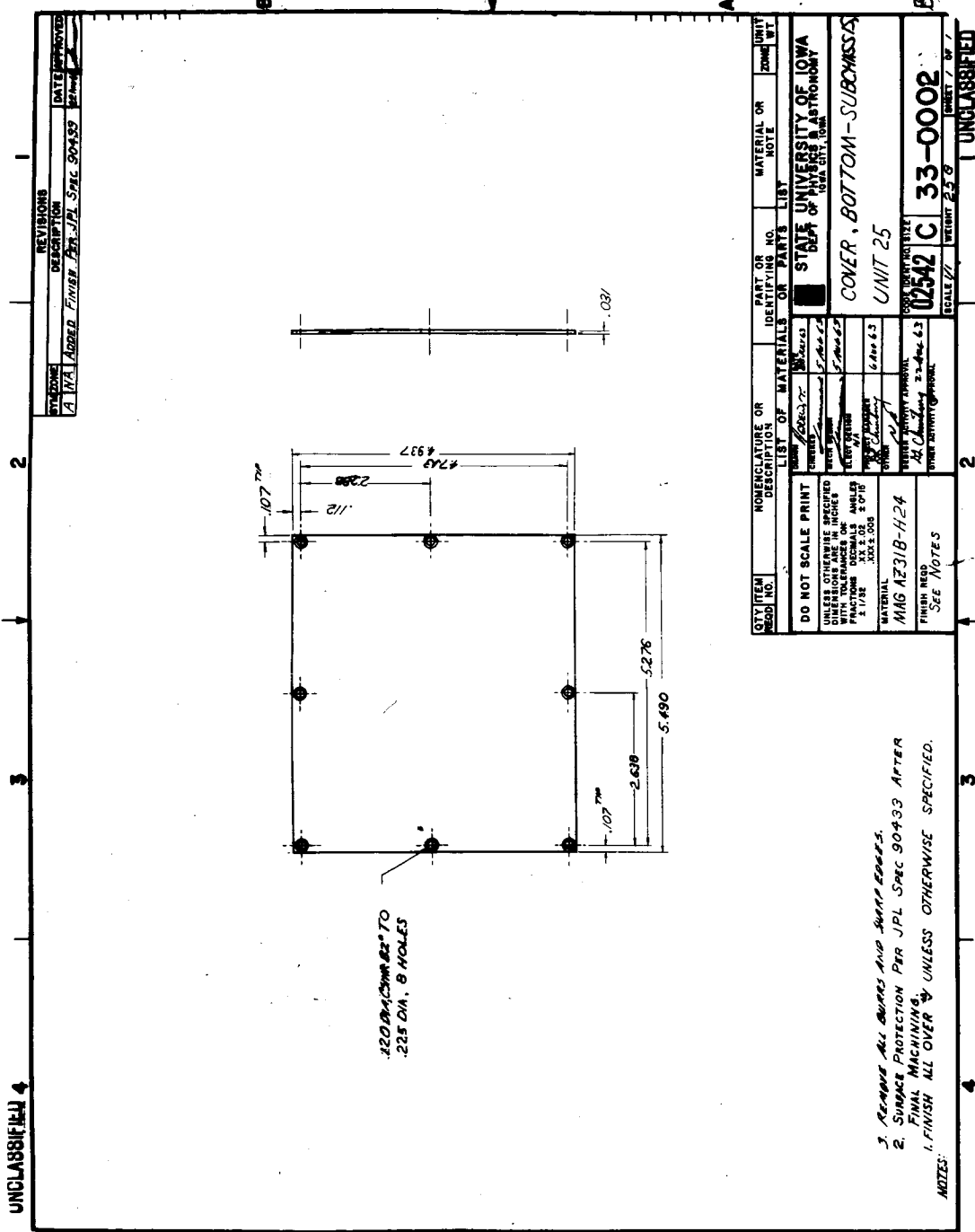


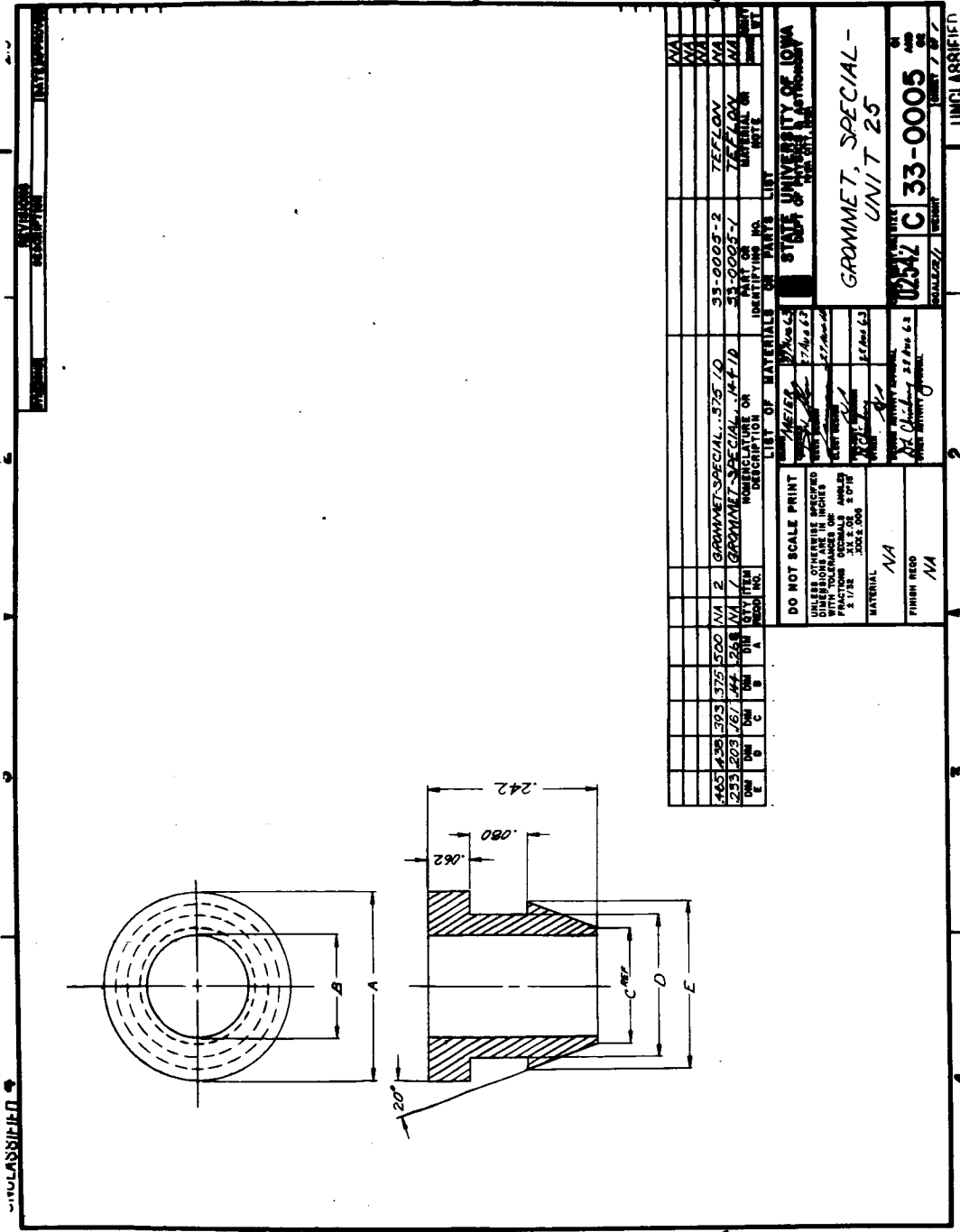
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B	4-1/2\"	1
C	4-1/2\"	1
D	4-1/2\"	1
E	4-1/2\"	1
F	4-1/2\"	1
G	4-1/2\"	1
H	4-1/2\"	1
I	4-1/2\"	1
J	4-1/2\"	1

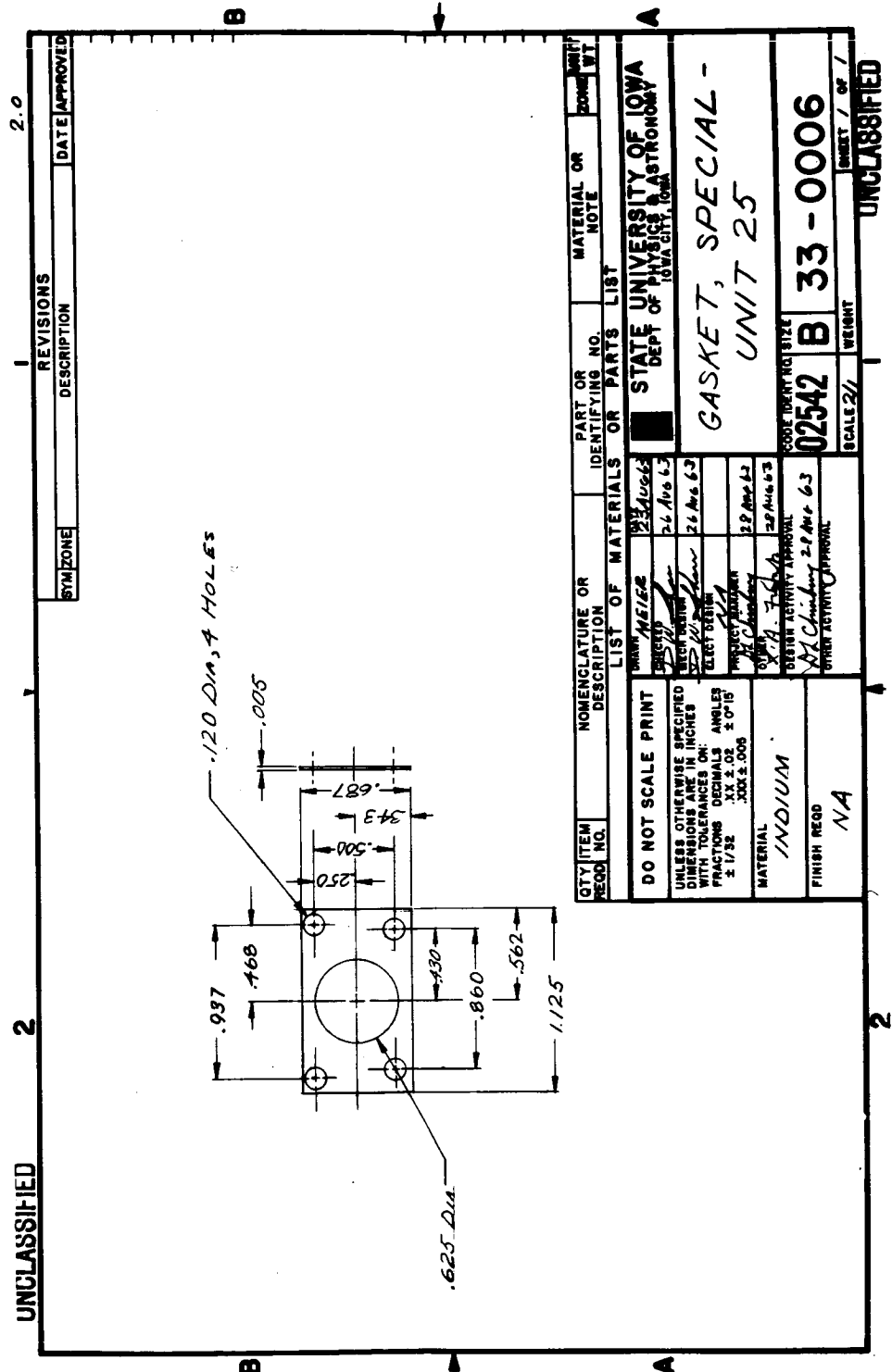
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C	4-1/2\"	1
D	4-1/2\"	1
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F	4-1/2\"	1
G	4-1/2\"	1
H	4-1/2\"	1
I	4-1/2\"	1
J	4-1/2\"	1

- 5. INDICATED SURFACE TO BE FINISHED FOR JPL SPEC 90202 4 AFTER FINAL MEASUREMENTS.
- 4. SURFACE PROTECTION FOR JPL SPEC 90438 AFTER FINAL MEASUREMENTS.
- 3. FAD BY UNLESS OTHERWISE SPECIFIED.
- 2. REMOVE ALL BURRS AND SHARP EDGES.
- NOTES: 1. ALL WALLS .002 UNLESS OTHERWISE SPECIFIED.

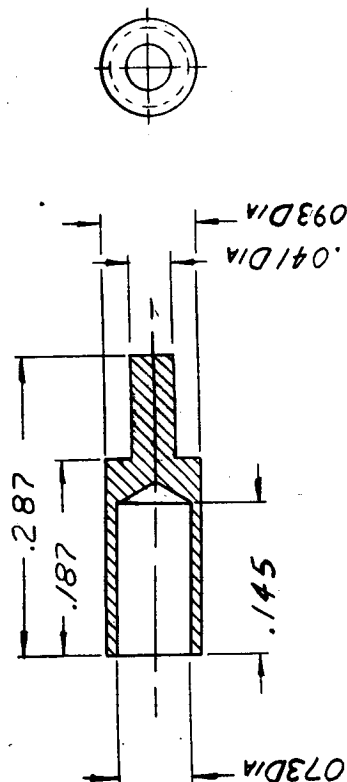
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C	4-1/2\"	1
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I	4-1/2\"	1
J	4-1/2\"	1





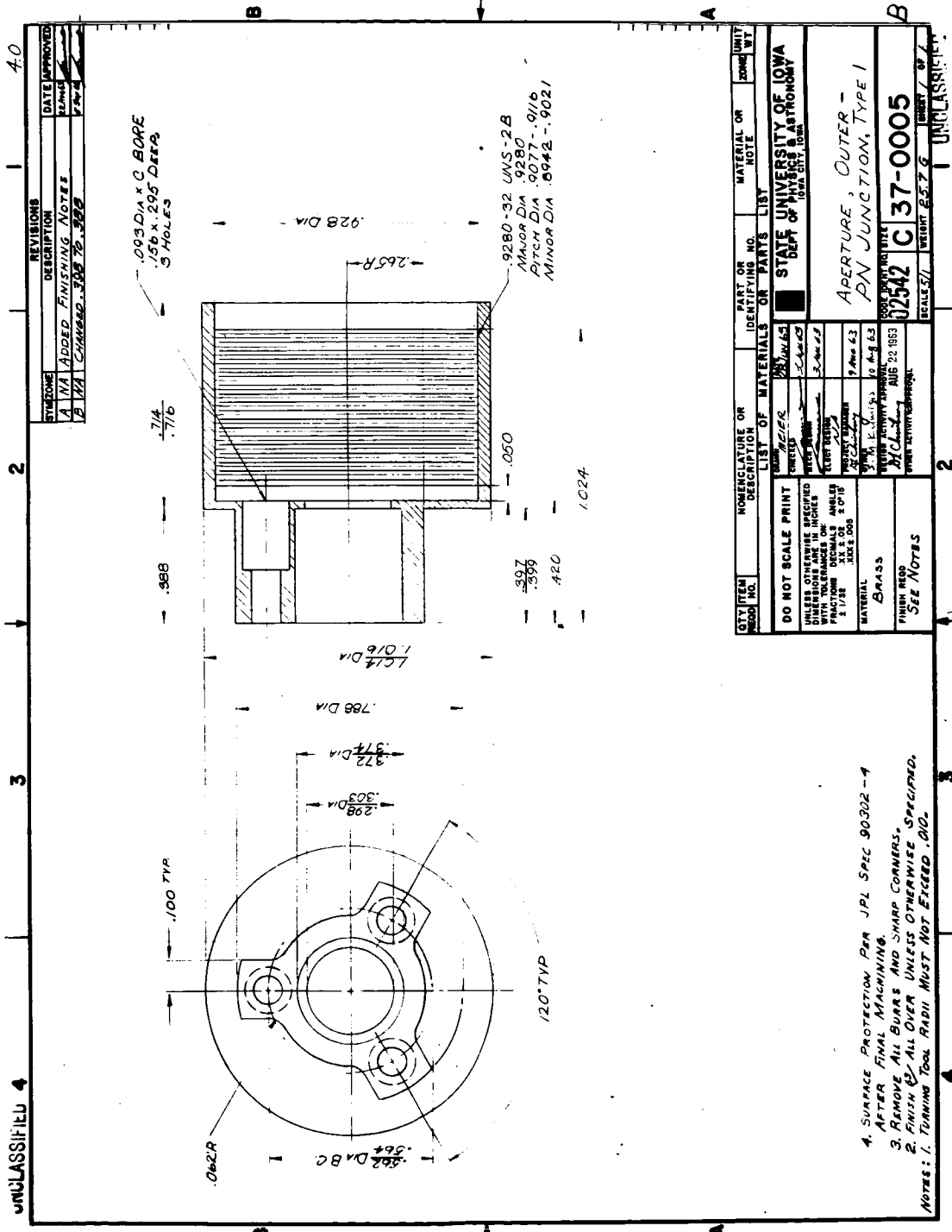


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SYN		REVISIONS		DATE APPROVED	
DESCRIPTION		DATE		APPROVED	
		PART OR IDENTIFYING NO.		MATERIAL OR NOTE	
		UNIT WT			
QTY ITEM REQD NO.		NOMENCLATURE OR DESCRIPTION		LIST OF MATERIALS OR PARTS LIST	
DO NOT SCALE PRINT		DRAWN <i>[Signature]</i> DATE <i>16 SEPT 63</i>		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005		CHECKED <i>[Signature]</i> DATE <i>16 SEPT 63</i>		TERMINAL, SPECIAL- UNIT 25	
MATERIAL BRASS		MECH DESIGN <i>[Signature]</i> DATE <i>17 SEPT 63</i>			
		ELECT DESIGN <i>[Signature]</i> DATE <i>17 SEPT 63</i>			
		PROJECT MANAGER <i>[Signature]</i> DATE <i>17 SEPT 63</i>			
		OTHER <i>[Signature]</i> DATE <i>17 SEPT 63</i>			
FINISH REQD NA		DESIGN ACTIVITY APPROVAL Date <i>17 Sept 63</i>		CODE IDENT NO. SIZE 02542 A	
		OTHER ACTIVITY APPROVAL		SCALE 1/1 WEIGHT SHEET 1 OF 1	

UNCLASSIFIED

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<p>2. REFERENCE DIMENSION, GASKET TO BE FITTED TO S.U.I. PN C37-0012.</p> <p>NOTES: 1. MATERIAL: TECHNIT RFI GASKETING STRIP, ROUND CROSS SECTION, 1/16 DIA, TECHNIT PN 21110.</p>				
<p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES</p> <p>FRACTIONS DECIMALS ANGLES</p> <p>± 1/32 ± 0.005 ± 0.15</p> <p>MATERIAL</p> <p>SEE NOTE 1.</p> <p>FINISH REQD</p> <p>NA</p>				
<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>GASKET - RF PN JUNCTION, TYPE I</p> <p>CODE IDENT NOT SIZE 02542 B 37-0011</p> <p>SCALE 1/1 WEIGHT SHEET 1 OF 1</p> <p>UNCLASSIFIED</p>				



4. SURFACE PROTECTION PER JPL SPEC 90302-4
AFTER FINAL MACHINING.
3. REMOVE ALL BURRS AND SHARP CORNERS.
2. FINISH @ ALL OVER UNLESS OTHERWISE SPECIFIED.
NOTES: 1. TURNING TOOL RADIUS MUST NOT EXCEED .010.

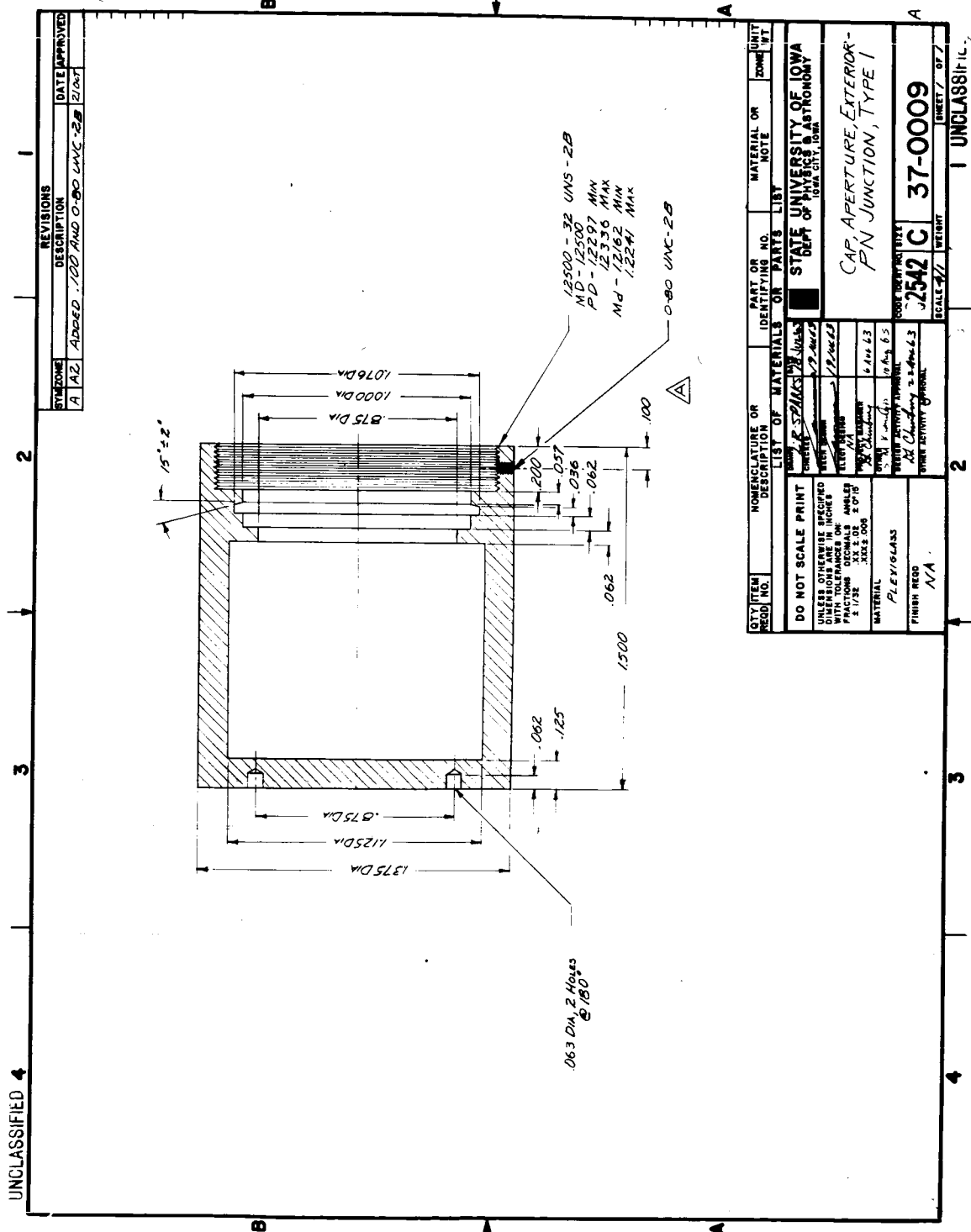
UNCLASSIFIED

32

SYN		REVISIONS		DATE APPROVED	
DESCRIPTION					
QTY ITEM		NOMENCLATURE OR DESCRIPTION		PART OR IDENTIFYING NO.	
RECD NO.					
LIST OF MATERIALS OR PARTS LIST					
DO NOT SCALE PRINT		DRAWN MEIER		JUN 26 63	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005		CHECKED [Signature]		JUN 63	
MATERIAL NICKEL SILVER		ELECT DESIGN NA		JUN 63	
FINISH RECD NA		PROJECT MANAGER [Signature]		6 AUG 63	
		OTHER S. M. Kuntz		10 AUG 63	
		DESIGN ACTIVITY APPROVAL [Signature]		22 AUG 63	
		OTHER ACTIVITY APPROVAL [Signature]			
		CODE IDENT NO. SIZE		02542 A 37-0002	
		SCALE 4/1		WEIGHT 1.0 G SHEET 1 OF 1	
STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA					
HOLDERS, FOIL, INNER - PN JUNCTION, TYPE I					
UNCLASSIFIED					

UNCLASSIFIED		2		40	
<p>SEE NOTE 1</p>		REVISIONS DESCRIPTION DATE APPROVED		DATE APPROVED DATE APPROVED	
		SYMZONE A		ADDED SET SCREW AND Baffle SCREW 12/24	
QTY ITEM REQD NO.		LIST OF MATERIALS OR PARTS LIST		UNIT ZONE WT	
1 6 SCREEN SET 1 5 SCREEN Baffle 1 4 ADAPTER CAP EXTERIOR-PN JCT. TYPE 1 1 3 Baffle-PN JCT 1 2 RING, RETAINING 1 1 CAP APERTURE EXTERIOR-PN JCT. 1 1 CAP APERTURE EXTERIOR-PN JCT.		0-80 UNC-2A x 1/25 A37-0036 C37-0008 A37-0007 N5002-100 C37-0009		STAINLESS STEEL NA NA NA NA WALDES KIMWOOD INC NA NA NA NA	
DO NOT SCALE PRINT UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES .XX ± .01 ± 0°15 .XXX ± .008		NAME SHAW, DIM 1/8 AUG 63 CHECKED 28 MAR 63 TECH DRAIN 28 MAR 63 ELECT DESIGN 28 MAR 63 PARTS MASTER 27 Sept 63 QTY, K-2, J-40 27 Aug 63 OTHER ACTIVITY APPROVAL OTHER ACTIVITY APPROVAL		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA	
MATERIAL N/A		SUBBASSY, MOUNT- DESICCANT, PN JCT, TYPE 1		CODE IDENT NO SIZE 02542 B 37-0017	
FINISH REQD N/A		SCALE 2/1		WEIGHT SHEET 1 OF 1	
UNCLASSIFIED		2		UNCLASSIFIED	

1. SOLDER ITEM (3) TO ITEM (3)
 NOTES: USING SORT SOLDER, NON-
 CORROSIVE FLUX.



UNCLASSIFIED

10

SYMBOL		REVISIONS		DATE APPROVED	
		DESCRIPTION			
QTY REQD	ITEM NO.	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT WT
LIST OF MATERIALS OR PARTS LIST					
DO NOT SCALE PRINT		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES		DRAWN MEIER CHECKED [Signature] MECH DESIGN [Signature] ELECT DESIGN [Signature] PROJECT MANAGER [Signature] OTHER [Signature] DATE 20 JUL 63 5 JUL 63 5 JUL 63 6 AUG 63 5 AUG 63			
MATERIAL		BAFFLE - PN JUNCTION, TYPE 1			
FINISH REQD		CODE IDENT NO. SIZE 000002 A 37-0007			
		SCALE 2/1		SHEET 1 OF 1	

UNCLASSIFIED

UNCLASSIFIED

2

REVISIONS

SYMBOL	DESCRIPTION	DATE APPROVED
A	CNC. 9280 THD TO .3750 ADD .300 9280-32-UNS-28	SCOTT

- 3750-32 UNS-28
MAJ DIA .3750
PITCH DIA .3547-.3586
MIN DIA .3412-.3491

MD. 9280
PITCH DIA .9077-.9116
MINORDIA .8942-.9021

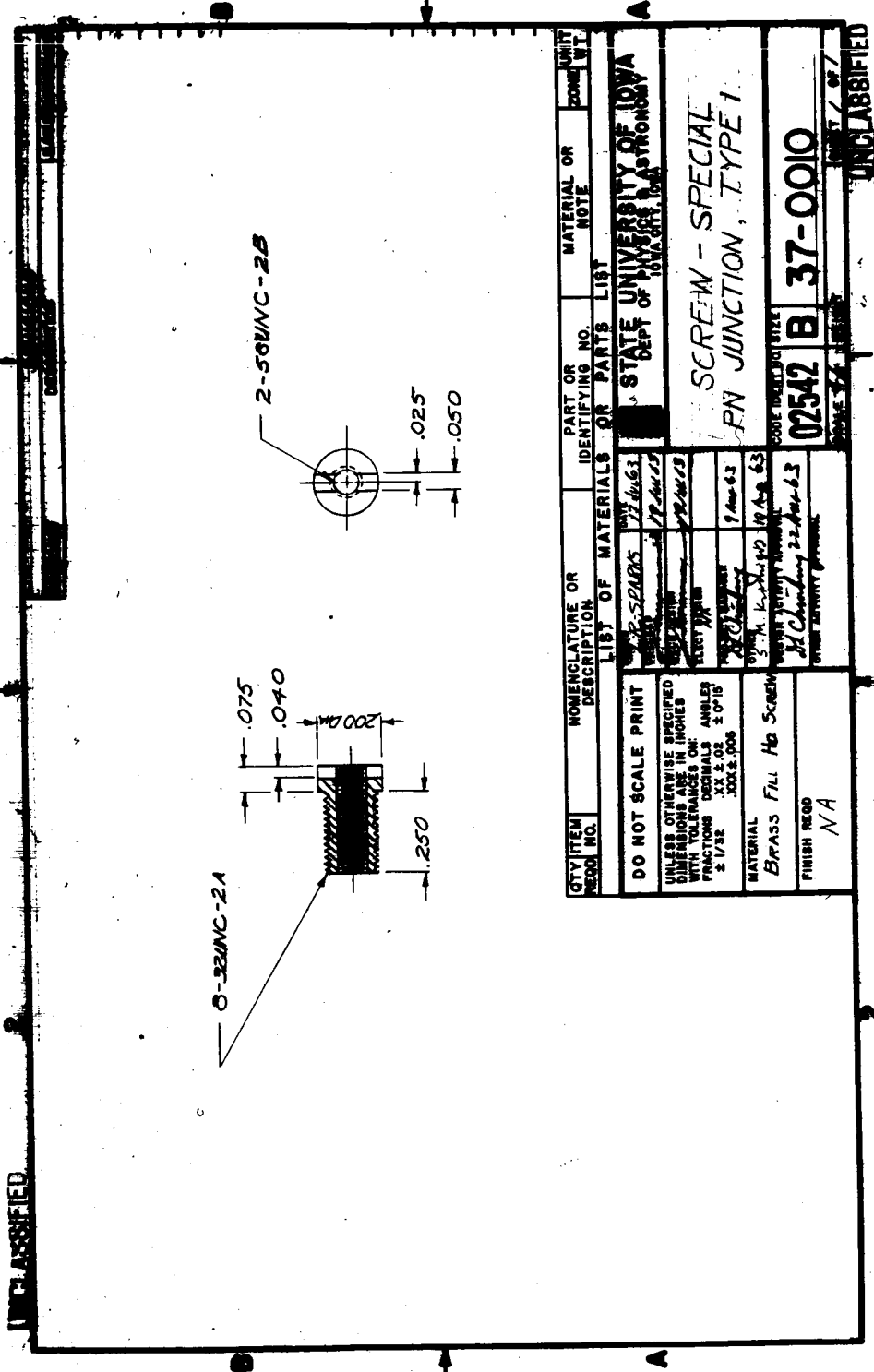
FINE CROSS KNURL

QTY ITEM REQD NO.	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT ZONE WT.
LIST OF MATERIALS OR PARTS LIST				
STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA				
HOLDER, SOURCE PN JUNCTION, TYPE 1				
CROSS IDENT NO SIZE 02542 B 37-0016				
SCALE 2 / 1 WEIGHT 1 OF 1				
DO NOT SCALE PRINT				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES WITH TOLERANCES ON: $\pm 1/32$.XX $\pm .02$ $\pm 0^{\circ}15'$.XXX $\pm .006$				
MATERIAL BRASS COML				
FINISH REQD NA				
DESIGN AUTHORITY APPROVAL R. C. Young 175cmr 6.3				
OTHER ACTIVITY APPROVAL				

UNCLASSIFIED

1.0

SYN		REVISIONS		DATE APPROVED	
DESCRIPTION		DESCRIPTION		DATE	
		<p>3. MACHINED FILLET RADIUS .020.</p> <p>2. FAO 125 UNLESS OTHERWISE SPECIFIED.</p> <p>NOTES: 1. REMOVE ALL BURRS AND SHARP EDGES.</p>		<p>STATE UNIVERSITY OF IOWA</p> <p>DEPT OF PHYSICS & ASTRONOMY</p> <p>IOWA CITY, IOWA</p>	
		<p>LOCK-MALE</p>		<p>CODE IDENT NO. SIZE</p> <p>02542 A</p>	
<p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES</p> <p>$\pm 1/32$ $.XX \pm .02$ $\pm 0^{\circ}15'$</p> <p>XXX $\pm .005$</p>		<p>DATE</p> <p>30 SEP 63</p> <p>10 DEC 63</p> <p>10 DEC 63</p> <p>10 DEC 63</p>		<p>SCALE 4/1</p> <p>WEIGHT</p> <p>SHEET / OF /</p>	
<p>MATERIAL</p> <p>TYPE A 286 STEEL</p>		<p>DESIGN ACTIVITY APPROVAL</p> <p>10 DEC 63</p>		<p>UNCLASSIFIED</p>	
<p>FINISH REQD</p> <p>SEE NOTES</p>		<p>OTHER ACTIVITY APPROVAL</p>			



QTY ITEM REQD NO.	NOMENCLATURE OR DESCRIPTION	LIBY OF MATERIALS	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT ZONE
DO NOT SCALE PRINT	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15 .XXX ± .006	0-32-50UNC-2A 17 Aug 63 0-32-50UNC-2B 17 Aug 63 0-32-50UNC-2C 17 Aug 63 0-32-50UNC-2D 17 Aug 63 0-32-50UNC-2E 17 Aug 63 0-32-50UNC-2F 17 Aug 63 0-32-50UNC-2G 17 Aug 63 0-32-50UNC-2H 17 Aug 63 0-32-50UNC-2I 17 Aug 63 0-32-50UNC-2J 17 Aug 63 0-32-50UNC-2K 17 Aug 63 0-32-50UNC-2L 17 Aug 63 0-32-50UNC-2M 17 Aug 63 0-32-50UNC-2N 17 Aug 63 0-32-50UNC-2O 17 Aug 63 0-32-50UNC-2P 17 Aug 63 0-32-50UNC-2Q 17 Aug 63 0-32-50UNC-2R 17 Aug 63 0-32-50UNC-2S 17 Aug 63 0-32-50UNC-2T 17 Aug 63 0-32-50UNC-2U 17 Aug 63 0-32-50UNC-2V 17 Aug 63 0-32-50UNC-2W 17 Aug 63 0-32-50UNC-2X 17 Aug 63 0-32-50UNC-2Y 17 Aug 63 0-32-50UNC-2Z 17 Aug 63	STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY	SCREW - SPECIAL PN JUNCTION, TYPE I	
MATERIAL	BRASS FILL No Screw	0-32-50UNC-2A 17 Aug 63 0-32-50UNC-2B 17 Aug 63 0-32-50UNC-2C 17 Aug 63 0-32-50UNC-2D 17 Aug 63 0-32-50UNC-2E 17 Aug 63 0-32-50UNC-2F 17 Aug 63 0-32-50UNC-2G 17 Aug 63 0-32-50UNC-2H 17 Aug 63 0-32-50UNC-2I 17 Aug 63 0-32-50UNC-2J 17 Aug 63 0-32-50UNC-2K 17 Aug 63 0-32-50UNC-2L 17 Aug 63 0-32-50UNC-2M 17 Aug 63 0-32-50UNC-2N 17 Aug 63 0-32-50UNC-2O 17 Aug 63 0-32-50UNC-2P 17 Aug 63 0-32-50UNC-2Q 17 Aug 63 0-32-50UNC-2R 17 Aug 63 0-32-50UNC-2S 17 Aug 63 0-32-50UNC-2T 17 Aug 63 0-32-50UNC-2U 17 Aug 63 0-32-50UNC-2V 17 Aug 63 0-32-50UNC-2W 17 Aug 63 0-32-50UNC-2X 17 Aug 63 0-32-50UNC-2Y 17 Aug 63 0-32-50UNC-2Z 17 Aug 63			
FINISH REQD	N/A				
CODE IDENTIFY SIZE					
02542 B 37-0010					
PAGE 34					
UNCLASSIFIED					

UNCLASSIFIED

QTY	ITEM	DESCRIPTION OR NOMENCLATURE	IDENTIFYING NO.	PARTS LIST	UNIT
1	22	MOTHERBOARD	D37-2007	NA	NA
1	21	RATE LIMITER	D37-2004	NA	NA
1	20	DISC REF PAGE	D37-2005	NA	NA
1	19	CONNECTOR	DEN-9P-NM-10	CANNON ELECT CO.	B3
1	18	CONNECTOR, 80W, CERAMIC	VK20CWI02	VITRAMON	B3
1	17	INDUCTOR, 180W	1537-BB5	DELEMAN	B3
1	16	CONNECTOR, 50W	550-31-61	MICRO-DOT CORP	B3
1	15	RESISTOR, SEE NOTE 1, 17W, 1W	NA	ALLEN BRADY	B3
1	14	RESISTOR, SEE NOTE 1, 17W, 1W	TYPE EM	IRC	B3
1	13	RESISTOR, SEE NOTE 1, 17W, 1W	TYPE EM	IRC	B3
1	12	PREAMP	C37-2023	NA	B3
1	11	SENSOR, 560 D	TSX-01	TEXAS INST CORP	A3
1	10	CONNECTOR, 80W, CERAMIC	VK30CWI03K	VITRAMON	B3
1	9	DELAT LINE	DL-B3B	VALOR ELECTRONICS	B3
1	8	TRIMPOT, 1K D	300P-1-102	BOURNS	B4
1	7	POST AMP - P0V	D37-2002-02	NA	B4
1	6	POST AMP - P0S	D37-2002-01	NA	B4
1	5	RATE LIMITER	D37-2002-03	NA	B4
1	4	POST AMP - P0D	D37-2002-04	NA	B4
1	3	POST AMP - P0D	D37-2003	NA	B4
1	2	DISCA - 1	D37-2003	NA	B4
1	1	DISCA - 2	D37-2003	NA	B4

UNCLASSIFIED

DO NOT SCALE PRINT

UNLESS OTHERWISE SPECIFIED, DIMENSIONS ARE TO BE TAKEN FROM THE CENTER OF THE PARTS LISTED WITH TOLERANCES ON FRACTIONS DECIMALS 2/100

DATE: 11/1/78

BY: JMK:008

STATE UNIVERSITY OF IOWA
DEPT OF ASTRONOMY

SUBASSY, ELECTRONICS-
PN JCT, TYPE I

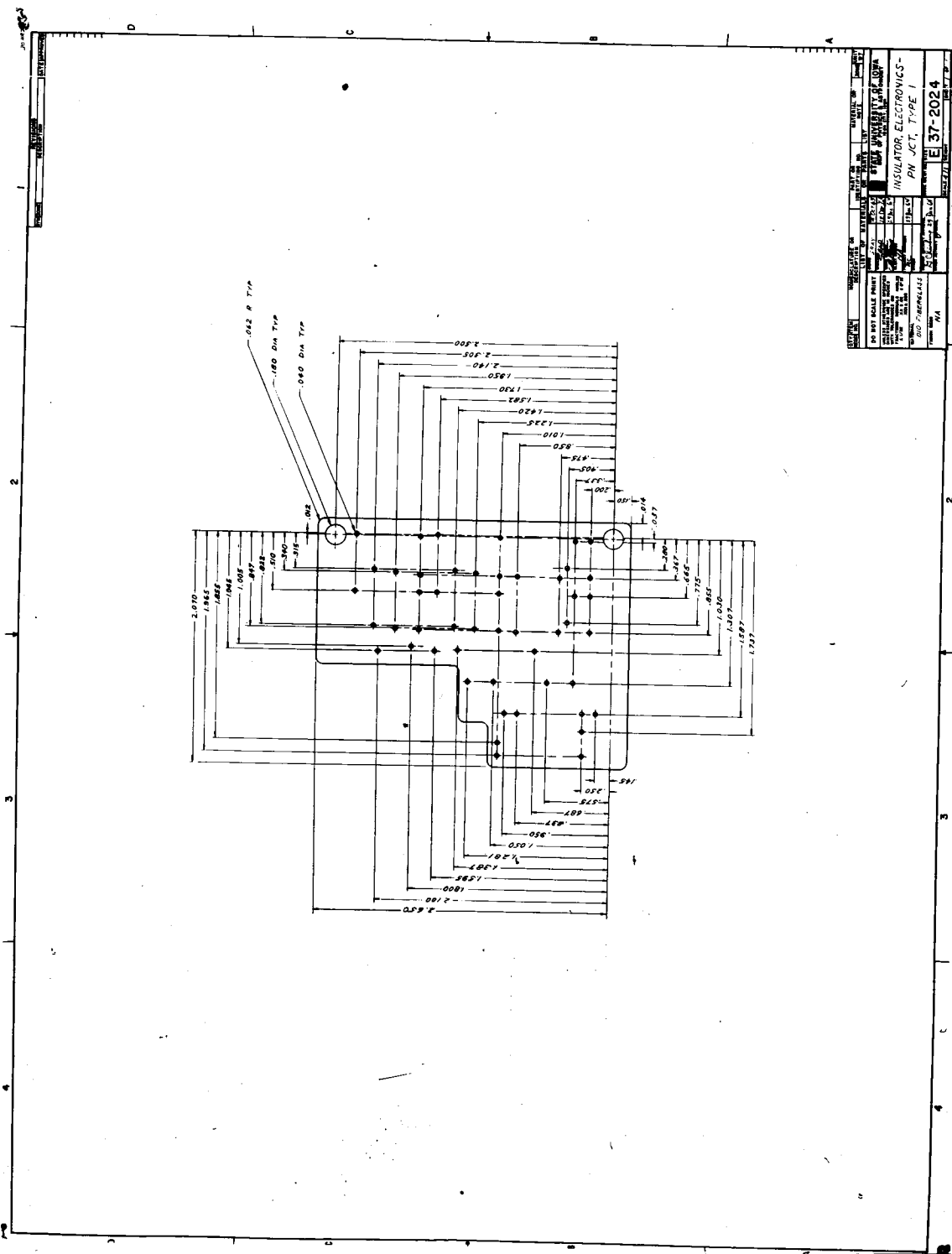
02544 C37-2006

SCALE: 1" = 1" WEIGHT: 1 SHEET OF 1

UNCLASSIFIED

NOTES: 1. BIASING RESISTORS, ITEMS 13, 14, AND 15 TO BE DETERMINED AT ASSY WITH INDIVIDUAL DETECTORS.

70



UNCLASSIFIED

5

QTY ITEM		NOMENCLATURE OR DESCRIPTION		PART OR IDENTIFYING NO.		MATERIAL OR NOTE		UNIT WT	
REQD NO.									
<div style="display: flex; justify-content: space-between;"> <div> <p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005</p> <p>MATERIAL COPPER</p> <p>FINISH REQD NA</p> </div> <div> </div> <div> <p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>BOX - PREAMP, PN JCT, TYPE 1</p> </div> </div>									
DRAWN SHAW, DW		DATE 22 Aug '63		CHECKED		MECH DESIGN		26 Aug '63	
PROJECT MANAGER		17 Sept '63		OTHER		S. M. K. Chm. 14.2		16 Sept '63	
DESIGN ACTIVITY APPROVAL		17 Sept '63		OTHER ACTIVITY APPROVAL					
CODE IDENT NO. SIZE		02542 A		37-2021		SCALE 2/1		WEIGHT	
SHEET / OF /		A		37-2021		UNCLASSIFIED			

UNCLASSIFIED

45

0-40 DIA

SYN		REVISIONS	
SYM	DESCRIPTION	DATE	APPROVED
A	CHANGE DIMENSION FROM .612 TO .621	30 OCT 63	

0-40 DIA

1.29 DIA, 3 HOLE'S

QTY	ITEM	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT WT
LIST OF MATERIALS OR PARTS LIST					
DO NOT SCALE PRINT					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON FRACTIONS DECIMALS ANGLES $\pm 1/32$ $.XX \pm .02$ ± 0.15 $.XXX \pm .005$					
MATERIAL COPPER					
FINISH REQ NA					

DRAWN		DATE	
MECH DESIGN	ELECT DESIGN	PROJECT MANAGER	OTHER
M/11 R	NA	NA	NA
CHECKED	DATE	DATE	DATE
26 AUG 63	26 AUG 63	30 OCT 63	30 OCT 63

DESIGN ACTIVITY APPROVAL	
DESIGN ACTIVITY	OTHER ACTIVITY
NA	NA

STATE UNIVERSITY OF IOWA	
DEPT OF PHYSICS & ASTRONOMY	
IOWA CITY, IOWA	
COVER, BOX - PRF AMP.	
PN JUNCTION	
TYPE 1	

CODE IDENT NO.	SIZE	WEIGHT	SHEET / OF
NA	A	37-2022	1 / 1

5

UNCLASSIFIED		REVISIONS		DATE APPROVED
		SYM	DESCRIPTION	
		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA		
		INSULATOR, TOP- PREAMP, PN JUNCTION, TYPE 1		
QTY ITEM REQD NO.	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT WT
LIST OF MATERIALS OR PARTS LIST				
DO NOT SCALE. PRINT		DRAWN MEIER	DATE 22 AUG 63	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005		CHECKED SD W. Schaefer	DATE 26 AUG 63	
MATERIAL FIBERGLASS		MECH DESIGN Eugene W. Schaefer	DATE 15 SEP 63	
FINISH REQD N/A		ELECT DESIGN [Signature]		
		PROJECT MANAGER [Signature]	DATE 17 SEP 63	
		OTHER [Signature]	DATE 16 SEP 63	
		DESIGN ACTIVITY APPROVAL [Signature]	DATE 17 SEP 63	
		OTHER ACTIVITY APPROVAL		
CODE IDENT NO. SIZE		02542 A 37-2018		
SCALE 2/1		SHEET 1 OF 1		

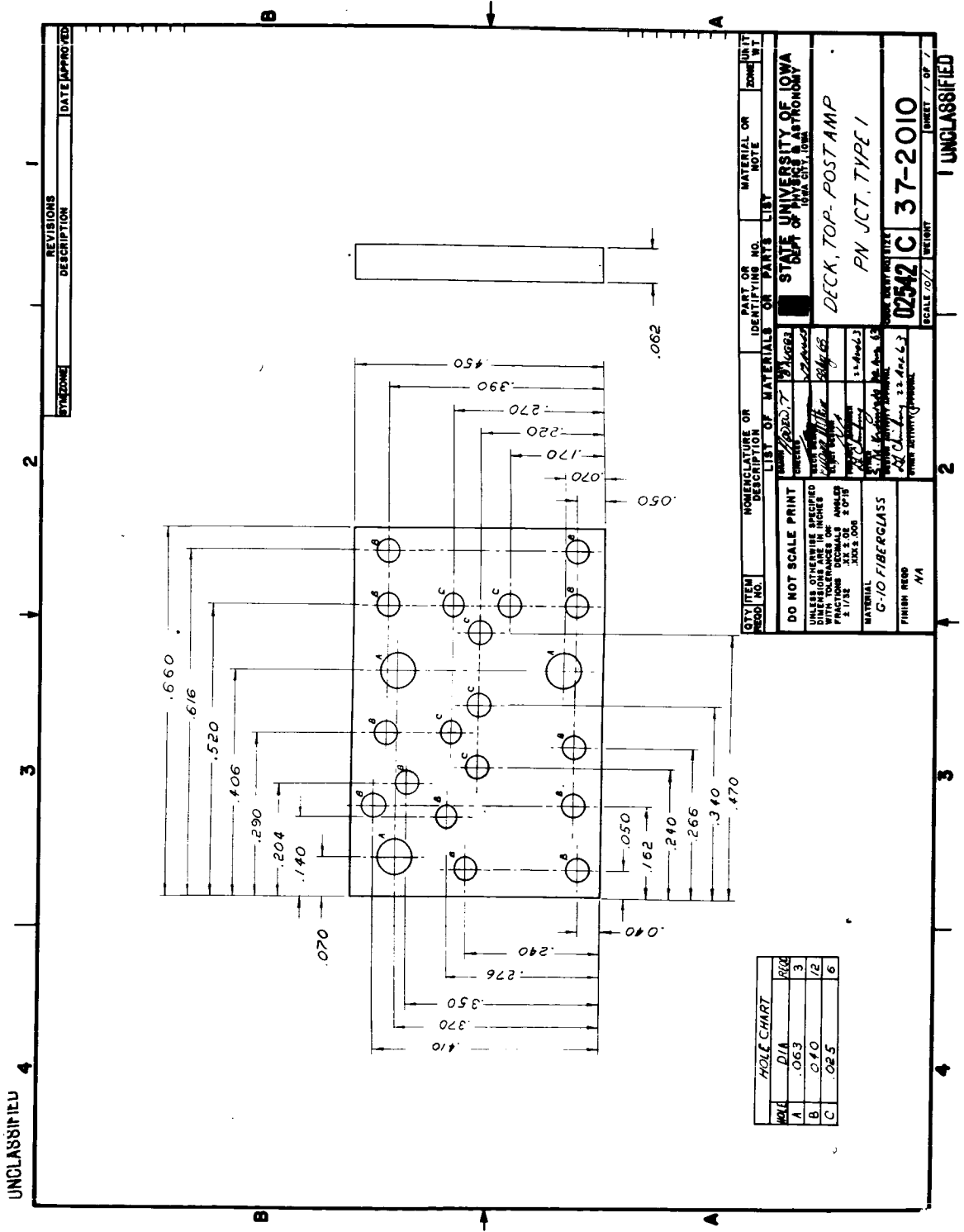
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.35

UNCLASSIFIED

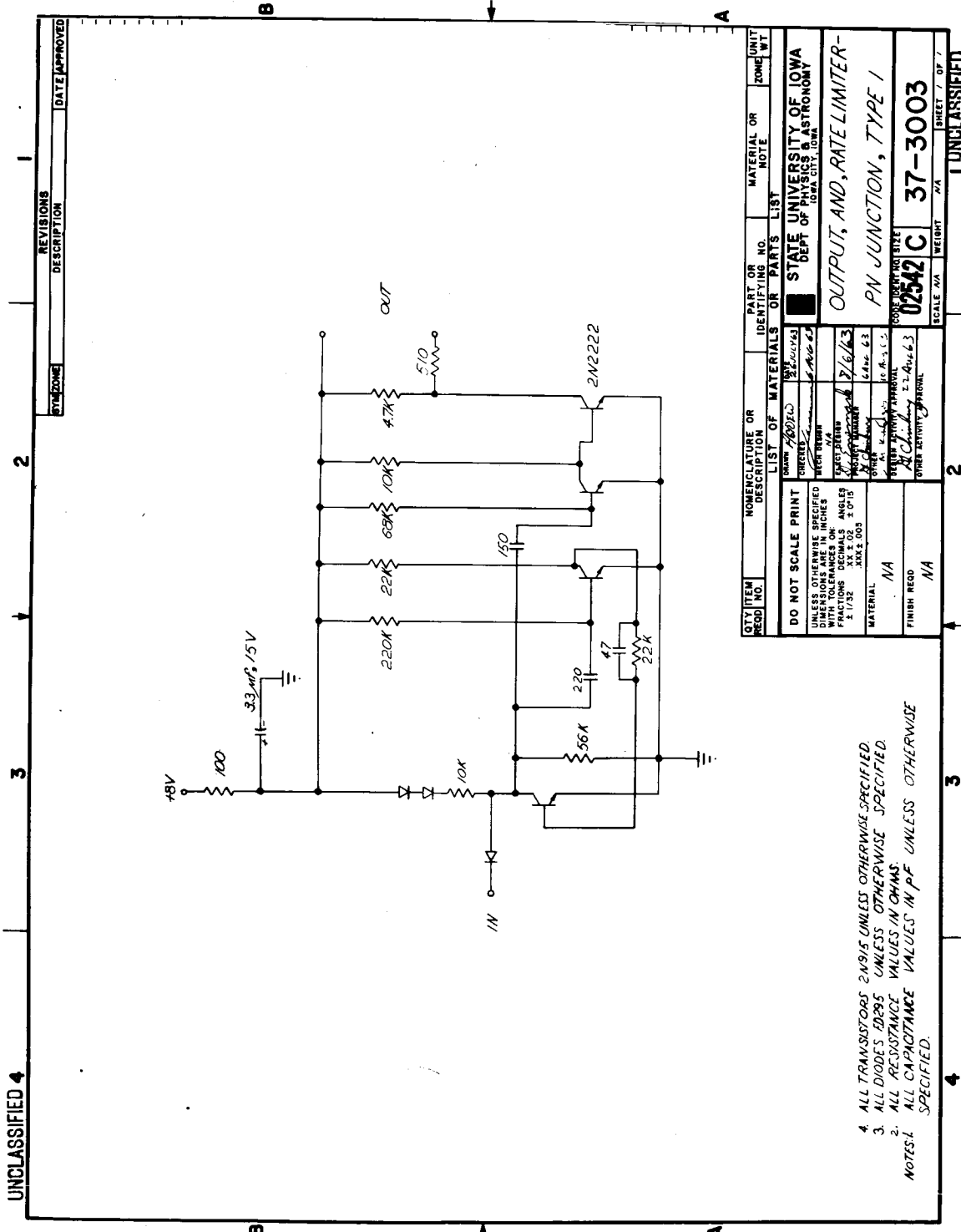
REVISIONS		DATE	APPROVED
SYM	DESCRIPTION		
QTY REQD		UNIT WT	
ITEM NO.		MATERIAL OR NOTE	
NOMENCLATURE OR DESCRIPTION		PART OR IDENTIFYING NO.	
LIST OF MATERIALS OR PARTS		LIST	
DRAWN MEIER		DATE 22 Aug 63	
CHECKED D.W. Shaw		DATE 26 Aug 63	
MECH DESIGN		DATE 13 Sept 63	
ELECT DESIGN		DATE	
PROJECT MANAGER		DATE 17 Sept 63	
OTHER		DATE 16 Sept 63	
DESIGN ACTIVITY APPROVAL		DATE 17 Sept 63	
OTHER ACTIVITY APPROVAL		DATE	
MATERIAL		FIBERGLASS	
FINISH REQD		N/A	
DO NOT SCALE PRINT		UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005	
STATE UNIVERSITY OF IOWA		DEPT OF PHYSICS & ASTRONOMY	
IOWA CITY, IOWA			
INSULATOR, BOTTOM -			
PREAMP, PN JUNCTION			
TYPE 1			
CODE IDENT NO. SIZE		02542 A 37-2019	
SCALE 2/1		WEIGHT	
SHEET 2/1		OF 1	

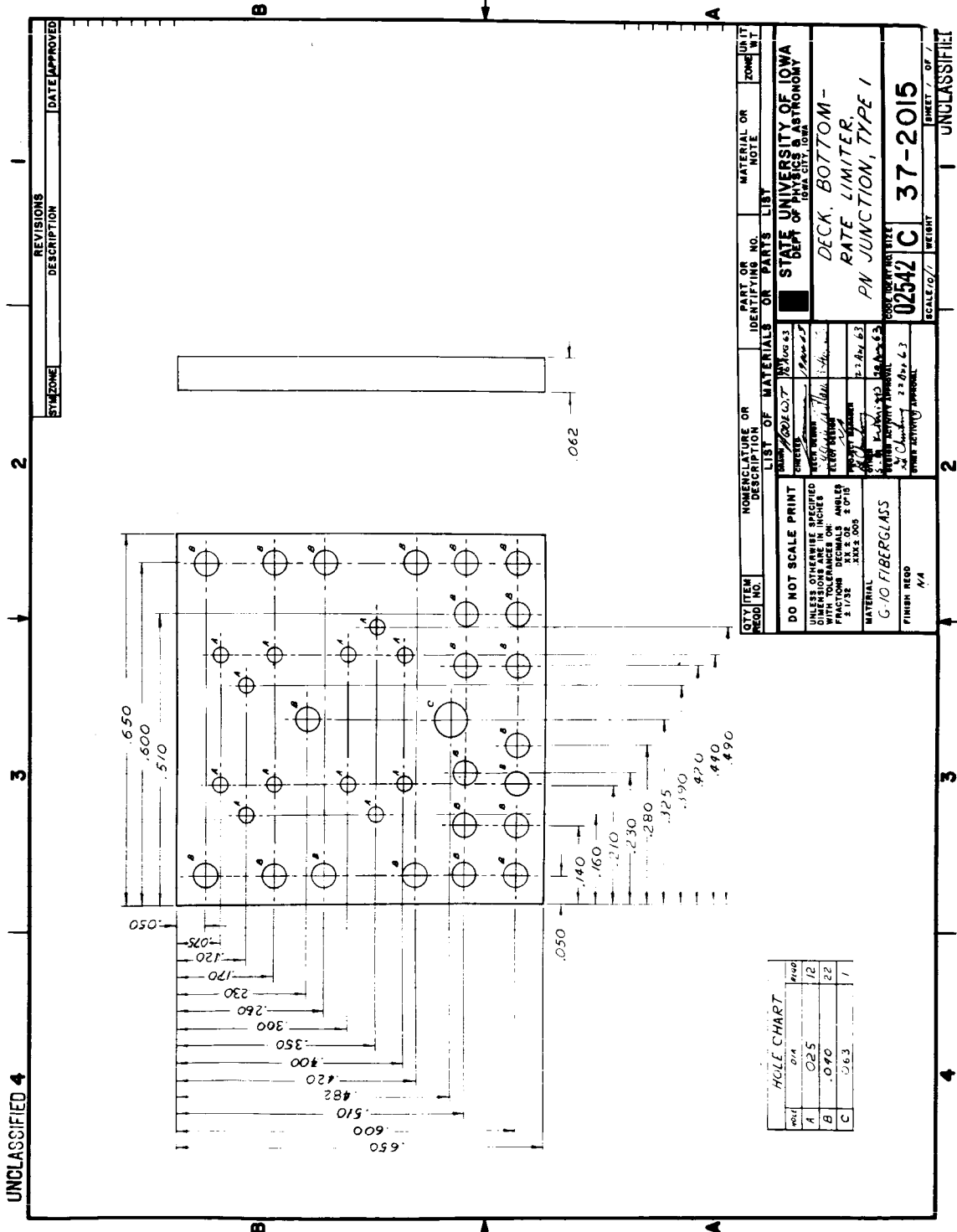
UNCLASSIFIED

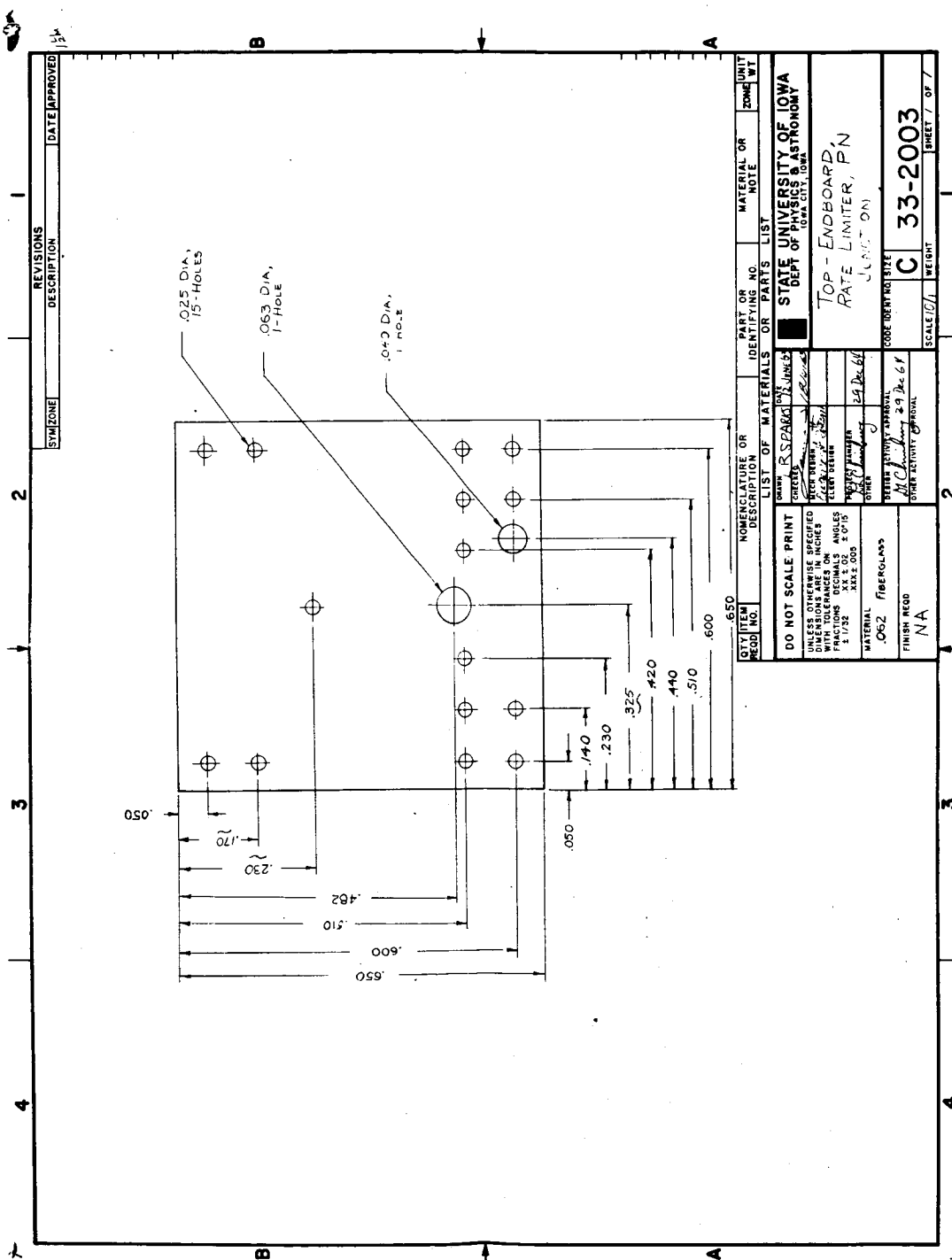


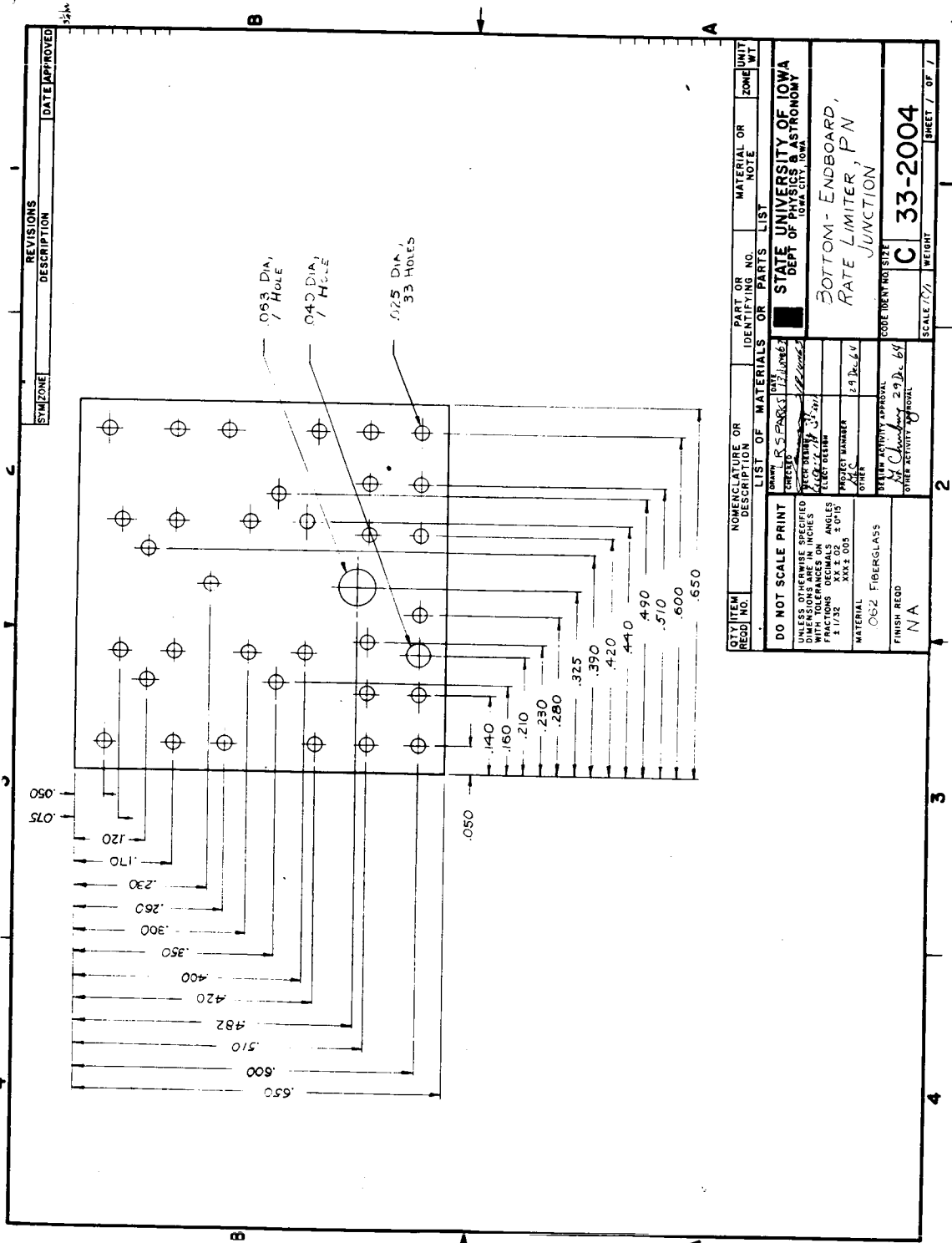
HOLE CHART	
SIZE	DIA
A	.063
B	.040
C	.025

QTY/ITEM	NOMENCLATURE OR	PART OR	MATERIAL OR	UNIT
NO.	DESCRIPTION	NO.	NOTE	NO.
1	DO NOT SCALE PRINT	1	STATE UNIVERSITY OF IOWA	1
2	UNLESS OTHERWISE SPECIFIED	2	DEPT OF ASTRONOMY	2
3	ALL DIMENSIONS ARE IN INCHES	3	DECK, TOP-POST AMP	3
4	WITH TOLERANCES OF	4	PN JCT, TYPE 1	4
5	FRACTIONS DECIMALS ANGLES	5		5
6	1/2 1/4 3/8 1/2 5/8 3/4 7/8	6		6
7	.001 .002 .005 .010 .015 .020	7		7
8	.030 .040 .050 .060 .070 .080	8		8
9	.090 .100 .125 .150 .175 .200	9		9
10	.250 .300 .375 .450 .500 .600	10		10
11	.750 1.000 1.250 1.500 1.750 2.000	11		11
12	2.500 3.000 3.500 4.000 4.500 5.000	12		12
13	5.500 6.000 6.500 7.000 7.500 8.000	13		13
14	8.500 9.000 9.500 10.000 10.500 11.000	14		14
15	11.500 12.000 12.500 13.000 13.500 14.000	15		15
16	14.500 15.000 15.500 16.000 16.500 17.000	16		16
17	17.500 18.000 18.500 19.000 19.500 20.000	17		17
18	20.500 21.000 21.500 22.000 22.500 23.000	18		18
19	23.500 24.000 24.500 25.000 25.500 26.000	19		19
20	26.500 27.000 27.500 28.000 28.500 29.000	20		20
21	29.500 30.000 30.500 31.000 31.500 32.000	21		21
22	32.500 33.000 33.500 34.000 34.500 35.000	22		22
23	35.500 36.000 36.500 37.000 37.500 38.000	23		23
24	38.500 39.000 39.500 40.000 40.500 41.000	24		24
25	41.500 42.000 42.500 43.000 43.500 44.000	25		25
26	44.500 45.000 45.500 46.000 46.500 47.000	26		26
27	47.500 48.000 48.500 49.000 49.500 50.000	27		27
28	50.500 51.000 51.500 52.000 52.500 53.000	28		28
29	53.500 54.000 54.500 55.000 55.500 56.000	29		29
30	56.500 57.000 57.500 58.000 58.500 59.000	30		30
31	59.500 60.000 60.500 61.000 61.500 62.000	31		31
32	62.500 63.000 63.500 64.000 64.500 65.000	32		32
33	65.500 66.000 66.500 67.000 67.500 68.000	33		33
34	68.500 69.000 69.500 70.000 70.500 71.000	34		34
35	71.500 72.000 72.500 73.000 73.500 74.000	35		35
36	74.500 75.000 75.500 76.000 76.500 77.000	36		36
37	77.500 78.000 78.500 79.000 79.500 80.000	37		37
38	80.500 81.000 81.500 82.000 82.500 83.000	38		38
39	83.500 84.000 84.500 85.000 85.500 86.000	39		39
40	86.500 87.000 87.500 88.000 88.500 89.000	40		40
41	89.500 90.000 90.500 91.000 91.500 92.000	41		41
42	92.500 93.000 93.500 94.000 94.500 95.000	42		42
43	95.500 96.000 96.500 97.000 97.500 98.000	43		43
44	98.500 99.000 99.500 100.000 100.500 101.000	44		44
45	101.500 102.000 102.500 103.000 103.500 104.000	45		45
46	104.500 105.000 105.500 106.000 106.500 107.000	46		46
47	107.500 108.000 108.500 109.000 109.500 110.000	47		47
48	110.500 111.000 111.500 112.000 112.500 113.000	48		48
49	113.500 114.000 114.500 115.000 115.500 116.000	49		49
50	116.500 117.000 117.500 118.000 118.500 119.000	50		50
51	119.500 120.000 120.500 121.000 121.500 122.000	51		51
52	122.500 123.000 123.500 124.000 124.500 125.000	52		52
53	125.500 126.000 126.500 127.000 127.500 128.000	53		53
54	128.500 129.000 129.500 130.000 130.500 131.000	54		54
55	131.500 132.000 132.500 133.000 133.500 134.000	55		55
56	134.500 135.000 135.500 136.000 136.500 137.000	56		56
57	137.500 138.000 138.500 139.000 139.500 140.000	57		57
58	140.500 141.000 141.500 142.000 142.500 143.000	58		58
59	143.500 144.000 144.500 145.000 145.500 146.000	59		59
60	146.500 147.000 147.500 148.000 148.500 149.000	60		60
61	149.500 150.000 150.500 151.000 151.500 152.000	61		61
62	152.500 153.000 153.500 154.000 154.500 155.000	62		62
63	155.500 156.000 156.500 157.000 157.500 158.000	63		63
64	158.500 159.000 159.500 160.000 160.500 161.000	64		64
65	161.500 162.000 162.500 163.000 163.500 164.000	65		65
66	164.500 165.000 165.500 166.000 166.500 167.000	66		66
67	167.500 168.000 168.500 169.000 169.500 170.000	67		67
68	170.500 171.000 171.500 172.000 172.500 173.000	68		68
69	173.500 174.000 174.500 175.000 175.500 176.000	69		69
70	176.500 177.000 177.500 178.000 178.500 179.000	70		70
71	179.500 180.000 180.500 181.000 181.500 182.000	71		71
72	182.500 183.000 183.500 184.000 184.500 185.000	72		72
73	185.500 186.000 186.500 187.000 187.500 188.000	73		73
74	188.500 189.000 189.500 190.000 190.500 191.000	74		74
75	191.500 192.000 192.500 193.000 193.500 194.000	75		75
76	194.500 195.000 195.500 196.000 196.500 197.000	76		76
77	197.500 198.000 198.500 199.000 199.500 200.000	77		77
78	200.500 201.000 201.500 202.000 202.500 203.000	78		78
79	203.500 204.000 204.500 205.000 205.500 206.000	79		79
80	206.500 207.000 207.500 208.000 208.500 209.000	80		80
81	209.500 210.000 210.500 211.000 211.500 212.000	81		81
82	212.500 213.000 213.500 214.000 214.500 215.000	82		82
83	215.500 216.000 216.500 217.000 217.500 218.000	83		83
84	218.500 219.000 219.500 220.000 220.500 221.000	84		84
85	221.500 222.000 222.500 223.000 223.500 224.000	85		85
86	224.500 225.000 225.500 226.000 226.500 227.000	86		86
87	227.500 228.000 228.500 229.000 229.500 230.000	87		87
88	230.500 231.000 231.500 232.000 232.500 233.000	88		88
89	233.500 234.000 234.500 235.000 235.500 236.000	89		89
90	236.500 237.000 237.500 238.000 238.500 239.000	90		90
91	239.500 240.000 240.500 241.000 241.500 242.000	91		91
92	242.500 243.000 243.500 244.000 244.500 245.000	92		92
93	245.500 246.000 246.500 247.000 247.500 248.000	93		93
94	248.500 249.000 249.500 250.000 250.500 251.000	94		94
95	251.500 252.000 252.500 253.000 253.500 254.000	95		95
96	254.500 255.000 255.500 256.000 256.500 257.000	96		96
97	257.500 258.000 258.500 259.000 259.500 260.000	97		97
98	260.500 261.000 261.500 262.000 262.500 263.000	98		98
99	263.500 264.000 264.500 265.000 265.500 266.000	99		99
100	266.500 267.000 267.500 268.000 268.500 269.000	100		100
101	269.500 270.000 270.500 271.000 271.500 272.000	101		101
102	272.500 273.000 273.500 274.000 274.500 275.000	102		102
103	275.500 276.000 276.500 277.000 277.500 278.000	103		103
104	278.500 279.000 279.500 280.000 280.500 281.000	104		104
105	281.500 282.000 282.500 283.000 283.500 284.000	105		105
106	284.500 285.000 285.500 286.000 286.500 287.000	106		106
107	287.500 288.000 288.500 289.000 289.500 290.000	107		107
108	290.500 291.000 291.500 292.000 292.500 293.000	108		108
109	293.500 294.000 294.500 295.000 295.500 296.000	109		109
110	296.500 297.000 297.500 298.000 298.500 299.000	110		110
111	299.500 300.000 300.500 301.000 301.500 302.000	111		111
112	302.500 303.000 303.500 304.000 304.500 305.000	112		112
113	305.500 306.000 306.500 307.000 307.500 308.000	113		113
114	308.500 309.000 309.500 310.000 310.500 311.000	114		114
115	311.500 312.000 312.500 313.000 313.500 314.000	115		115
116	314.500 315.000 315.500 316.000 316.500 317.000	116		116
117	317.500 318.000 318.500 319.000 319.500 320.000	117		117
118	320.500 321.000 321.500 322.000 322.500 323.000	118		118
119	323.500 324.000 324.500 325.000 325.500 326.000	119		119
120	326.500 327.000 327.500 328.000 328.500 329.000	120		120
121	329.500 330.000 330.500 331.000 331.500 332.000	121		121
122	332.500 333.000 333.500 334.000 334.500 335.000	122		122
123	335.500 336.000 336.500 337.000 337.500 338.000	123		123
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125	341.500 342.000 342.500 343.000 343.500 344.000	125		125
126	344.500 345.000 345.500 346.000 346.500 347.000	126		126
127	347.500 348.000 348.500 349.000 349.500 350.000	127		127
128	350.500 351.000 351.500 352.000 352.500 353.000	128		128
129	353.500 354.000 354.500 355.000 355.500 356.000	129		129
130	356.500 357.000 357.500 358.000 358.500 359.000	130		130
131	359.500 360.000 360.500 361.000 361.500 362.000	131		131
132	362.500 363.000 363.500 364.000 364.500 365.000	132		132
133	365.500 366.000 366.500 367.000 367.500 368.000	133		133
134	368.500 369.000 369.500 370.000 370.500 371.000	134		134
135	371.500 372.000 372.500 373.000 373.500 374.000	135		135
136	374.500 375.000 375.500 376.000 376.500 377.000	136		136
137	377.500 378.000 378.500 379.000 379.500 380.000	137		137
138	380.500 381.000 381.500 382.000 382.500 383.000	138		138
139	383.500 384.000 384.500 385.000 385.500 386.000	139		139
140	386.500 387.000 387.500 388.000 388.500 389.000	140		140
141	389.500 390.000 390.500 391.000 391.500 392.000	141		141
142	392.500 393.000 393.500 394.000 394.500 395.000	142		142
143	395.500 396.000 396.500 397.000 397.500 398.000	143		143
144	398.500 399.000 399.500 400.000 400.500 401.000	144		144
145	401.500 402.000 402.500 403.000 403.500 404.000	145		145
146	404.500 405.000 405.500 406.000 406.500 407.000	146		146
147	407.500 408.000 408.500 409.000 409.500 410.000	147		147
148	410.500 411.000 411.500 412.000 412.500 413.000	148		148
149	413.500 414.000 414.500 415.000 415.500 416.000	149		149
150	416.500 417			

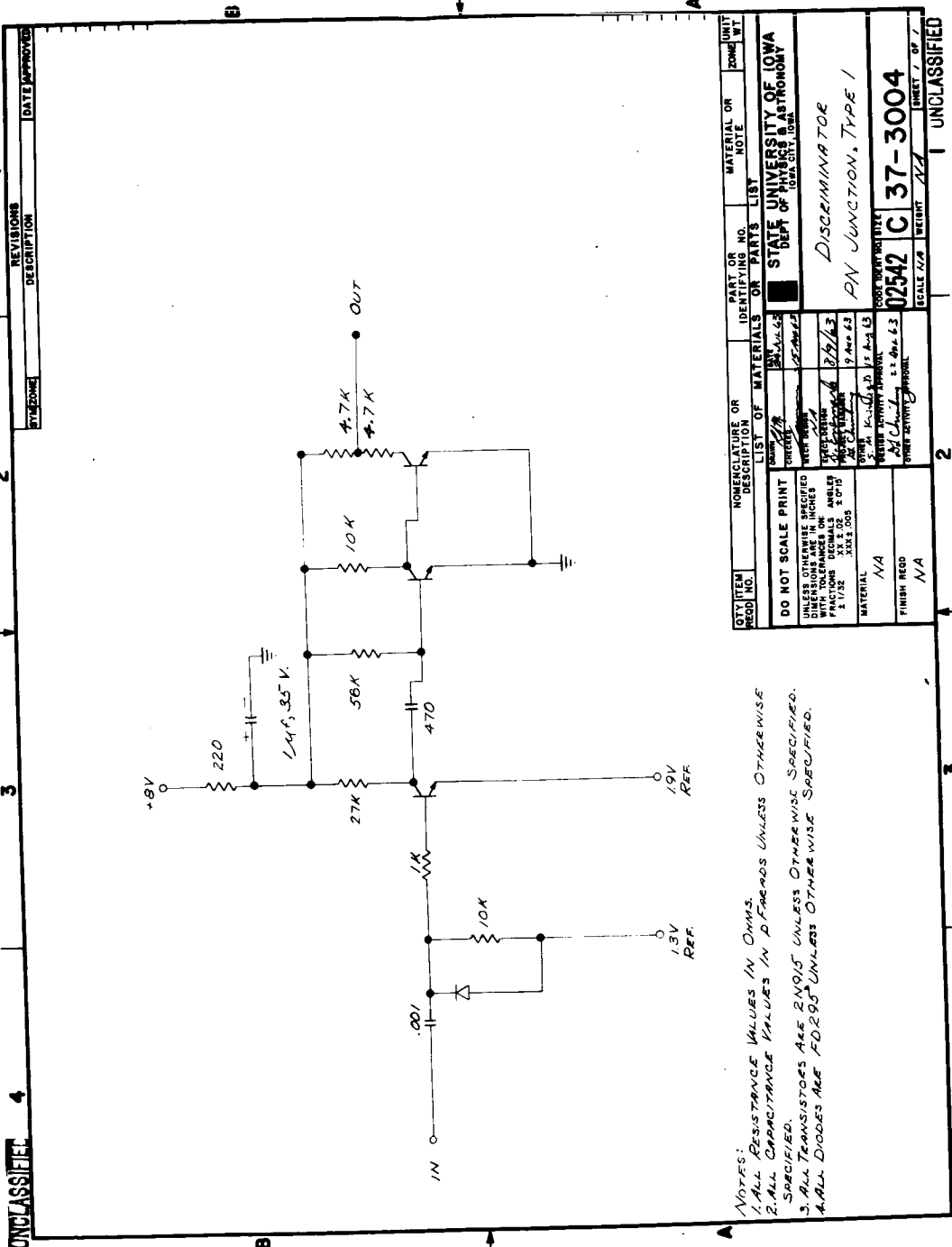






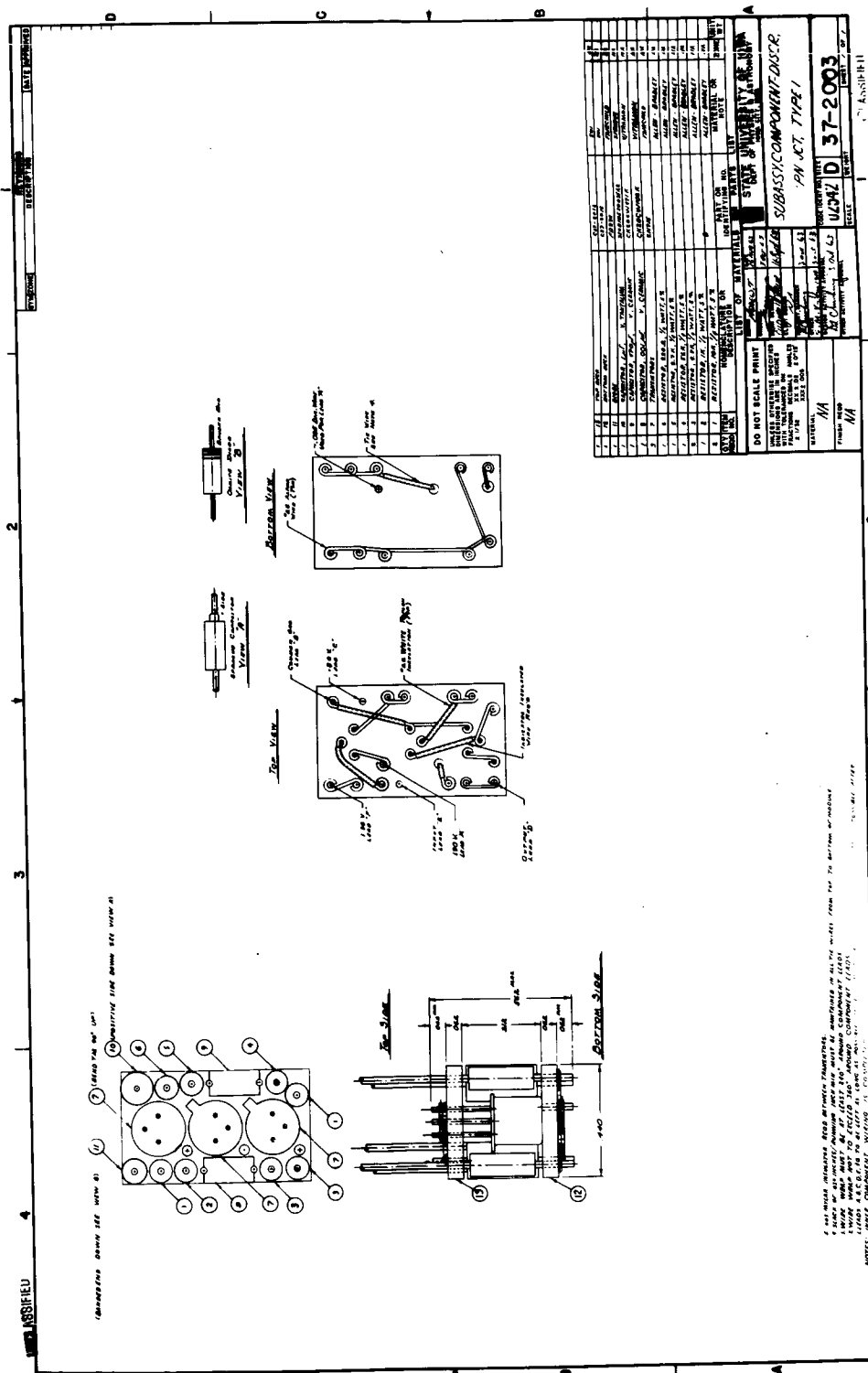


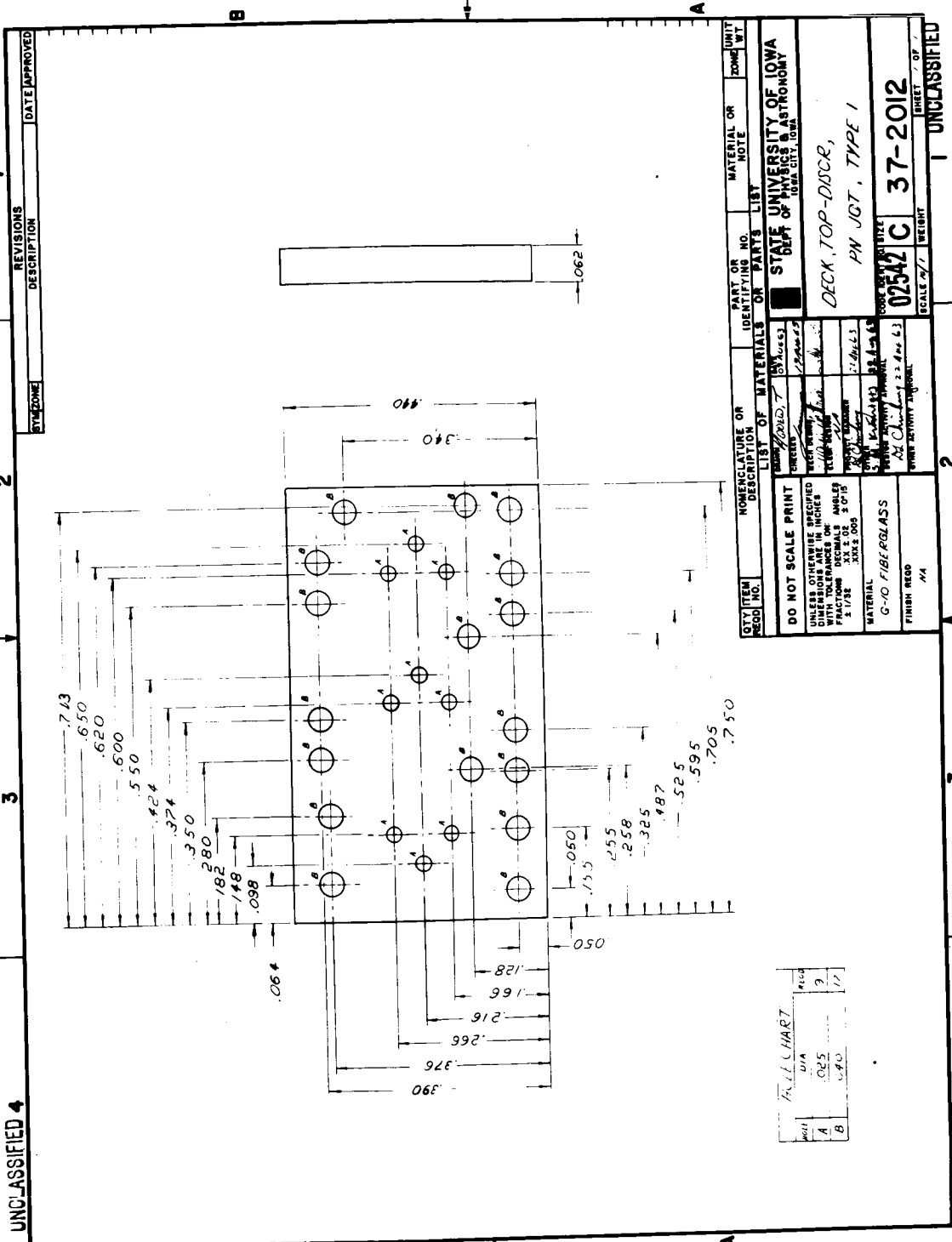
94



NOTES:
 1. ALL RESISTANCE VALUES IN OHMS.
 2. ALL CAPACITANCE VALUES IN P-FARADS UNLESS OTHERWISE SPECIFIED.
 3. ALL TRANSISTORS ARE 2N4015 UNLESS OTHERWISE SPECIFIED.
 4. ALL DIODES ARE FD295 UNLESS OTHERWISE SPECIFIED.

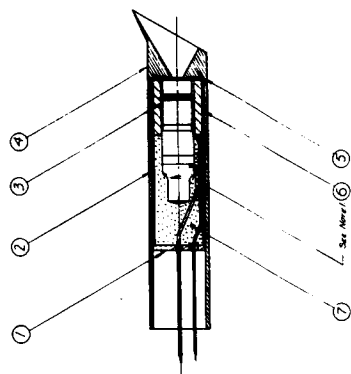
UNCLASSIFIED		1.0	
REVISIONS		DATE APPROVED	
DESCRIPTION			
SYMBOLOGY			
NOMENCLATURE OR DESCRIPTION		PART OR IDENTIFYING NO.	MATERIAL OR UNIT
LIST OF MATERIALS		LIST	ZONE
DO NOT SCALE PRINT		STATE UNIVERSITY OF IOWA	
UNLESS OTHERWISE SPECIFIED		DEPT. OF ASTRONOMY	
DIMENSIONS ARE IN INCHES		IOWA CITY, IOWA	
FRACTIONS ARE IN DECIMALS		DISCRIMINATOR	
UNLESS OTHERWISE SPECIFIED		P-N JUNCTION, TYPE 1	
MATERIAL		Q2542	C 37-3004
FINISH REQD		SCALE 1/4"	SHEET 1 OF 1
OTHER ACTIVITY		UNCLASSIFIED	





FILE CHART

FILE	DATE	BY
A	06/5	9
B	07/0	11



UNCLASSIFIED		2		3		B		A	
SYMBOL		REVISIONS		DATE APPROVED		MATERIAL OR		UNIT	
DESCRIPTION		DESCRIPTION		DESCRIPTION		NOTE		WT.	
		<p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005</p>		<p>LIST OF MATERIALS OR PARTS LIST</p> <p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p>		<p>PLUG - END, 213 GM, TYPE 6</p>		<p>CODE IDENT NO SIZE 02542 B 35-0011</p>	
<p>QTY/ITEM REQD NO.</p>		<p>NOMENCLATURE OR DESCRIPTION</p>		<p>PART OR IDENTIFYING NO.</p>		<p>MATERIAL OR NOTE</p>		<p>UNIT WT.</p>	
<p>DO NOT SCALE PRINT</p>		<p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005</p>		<p>LIST OF MATERIALS OR PARTS LIST</p>		<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p>		<p>PLUG - END, 213 GM, TYPE 6</p>	
<p>MATERIAL</p>		<p>FORMICA FF-91</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>SCALE 1/1</p>	
<p>FINISH REQD</p>		<p>NA</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>WEIGHT .54 G</p>	
<p>FINISH REQD</p>		<p>NA</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>SHEET 1 OF 1</p>	
<p>FINISH REQD</p>		<p>NA</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>DATE ACTIVITY APPROVAL</p>		<p>UNCLASSIFIED</p>	

UNCLASSIFIED

2

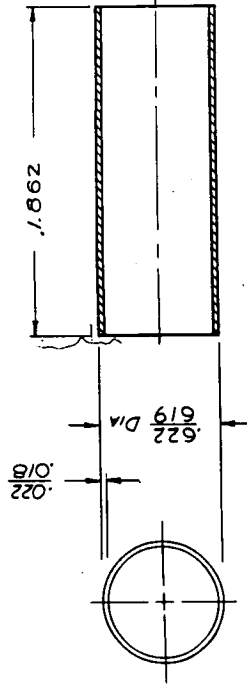
REVISIONS

DESCRIPTION	DATE	AMOUNT	REMARKS
...

SYNOPSIS

DATE

APPROVED



QTY ITEM REQD NO.	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	ZONE	UNIT WT
LIST OF MATERIALS					
DO NOT SCALE PRINT	UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMAL ANGLES $\pm .01 \pm .02 \pm .015$ XXX ± .005	STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA			
MATERIAL	TEFLON	SLEEVE, INSULATOR - 2 1/3 GM, TYPE O			
FINISH REQD	N/A				
OTHER ACTIVITY APPROVAL		SCALE 2 1/1		WEIGHT 2.76 G	SHEET 7 OF 1
DESIGN ACTIVITY APPROVAL		CODE IDENT NO SIZE		35-0012	
DATE CHANGING 22 AUG 63		02542 B			
DRAWN BY SPARKS		3 NOV 63			
CHECKED BY DEWITT		11 NOV 63			
ELECT DESIGN		11 NOV 63			
PROJECT NUMBER		5 AUG 63			
BY CHANGING		1 AUG 63			

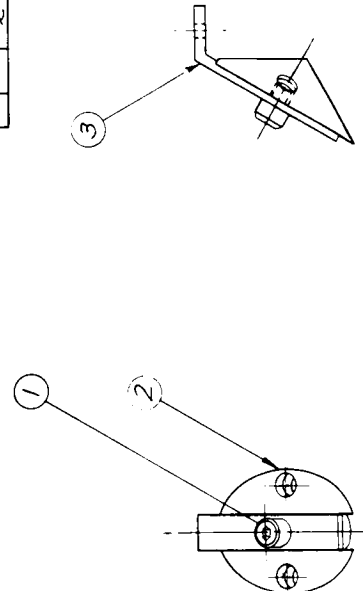
		REVISIONS DESCRIPTION DATE APPROVED	
UNCLASSIFIED		UNCLASSIFIED	

QTY ITEM REQD NO.	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT WT
LIST OF MATERIALS OR PARTS LIST				
DO NOT SCALE PRINT				
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES $\pm 1/32$ $\pm .02$ $\pm 0'15''$ $\pm .005$				
MATERIAL TEFLON				
FINISH REQD NA				

STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA	
SPACER, FRONT - 213 GM, TYPE 6	
02542 B	35-0013
SCALE 4/1 WEIGHT .50 g SHEET 1 OF 1	

SYMBOL		REVISIONS		DATE APPROVED	
DESCRIPTION		DESCRIPTION		DATE	
QTY ITEM REQD NO.		NOMENCLATURE OR DESCRIPTION		PART OR IDENTIFYING NO.	
DO NOT SCALE PRINT		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA		MATERIAL OR NOTE	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' XXX ± .005		LIST OF MATERIALS OR PARTS		UNIT WT	
MATERIAL		BLOCK, MOUNTING - 213 GM, TYPE 6			
FINISH REQD		SEE NOTE 1.			
NOTES: 1. FOAM, LOW DENSITY, Ecco Foam FP Catalyst No 12-6.		CODE IDENTIFYING NO.		SHEET 1 OF 1	
		02547 B		35-0010	
		SCALE 4/1		WEIGHT 1.07 G	

SYMBOL		REVISIONS		DATE APPROVED	
A		DESCRIPTION		2100T	
A		CHANGED SIZE OF IDEAS 2x3 (WENT OUT OF SCALE)		2100T	



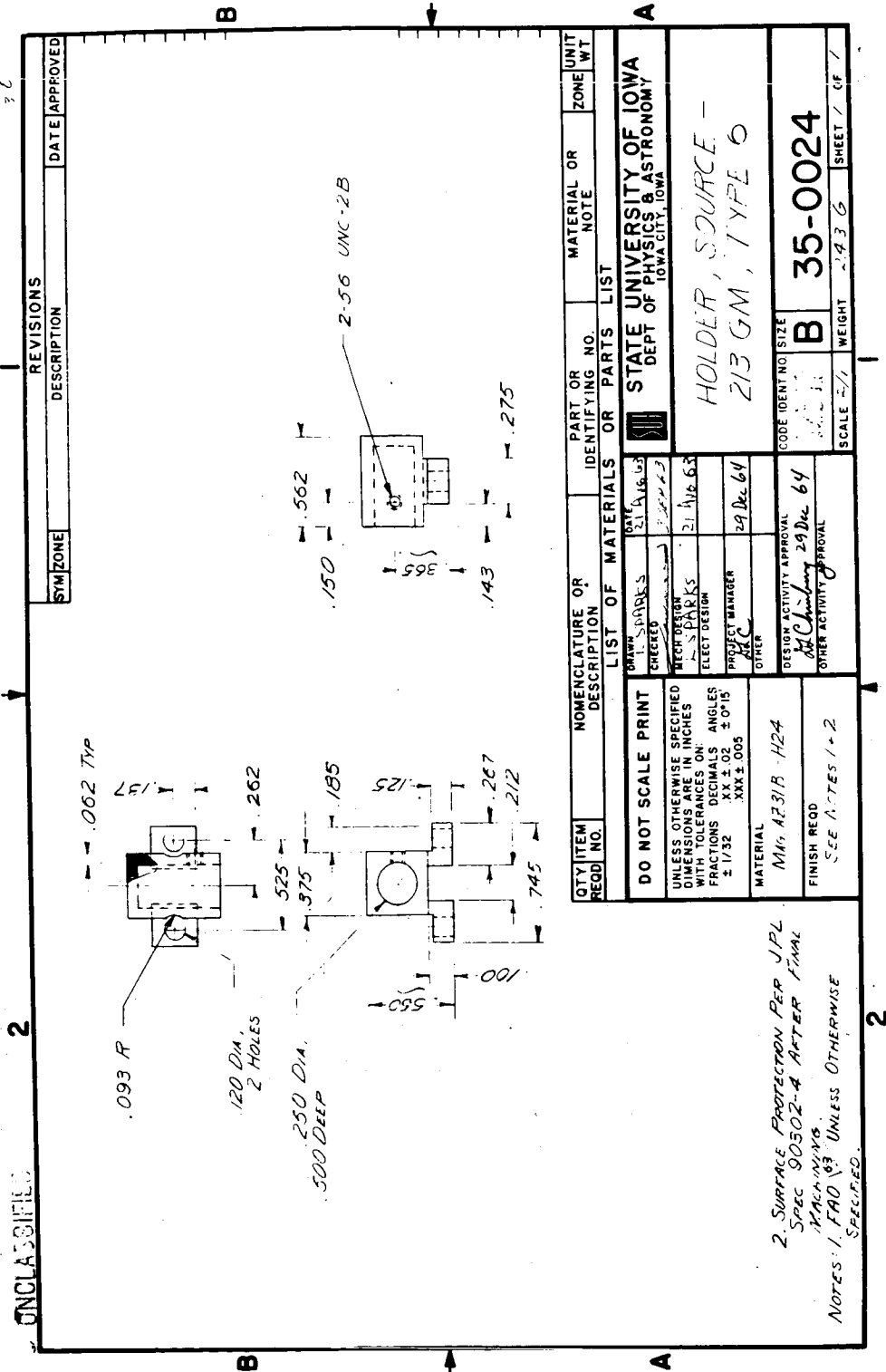
QTY	ITEM	DESCRIPTION	IDENTIFYING NO.	MATERIAL OR NOTE	UNIT	ZONE	WT
1	3	BRACKET, CAP - 213 GM TYPE 0	B 35-0016	NA	NA	21	21
1	2	CAP, PROTECTIVE - TYPE 0	B 35-0015	NA	NA	21	21
1	1	SCREW, ALLEN HEAD	4-40 UNC-2A x .250	ALLEN MFG CO	NA	90	90

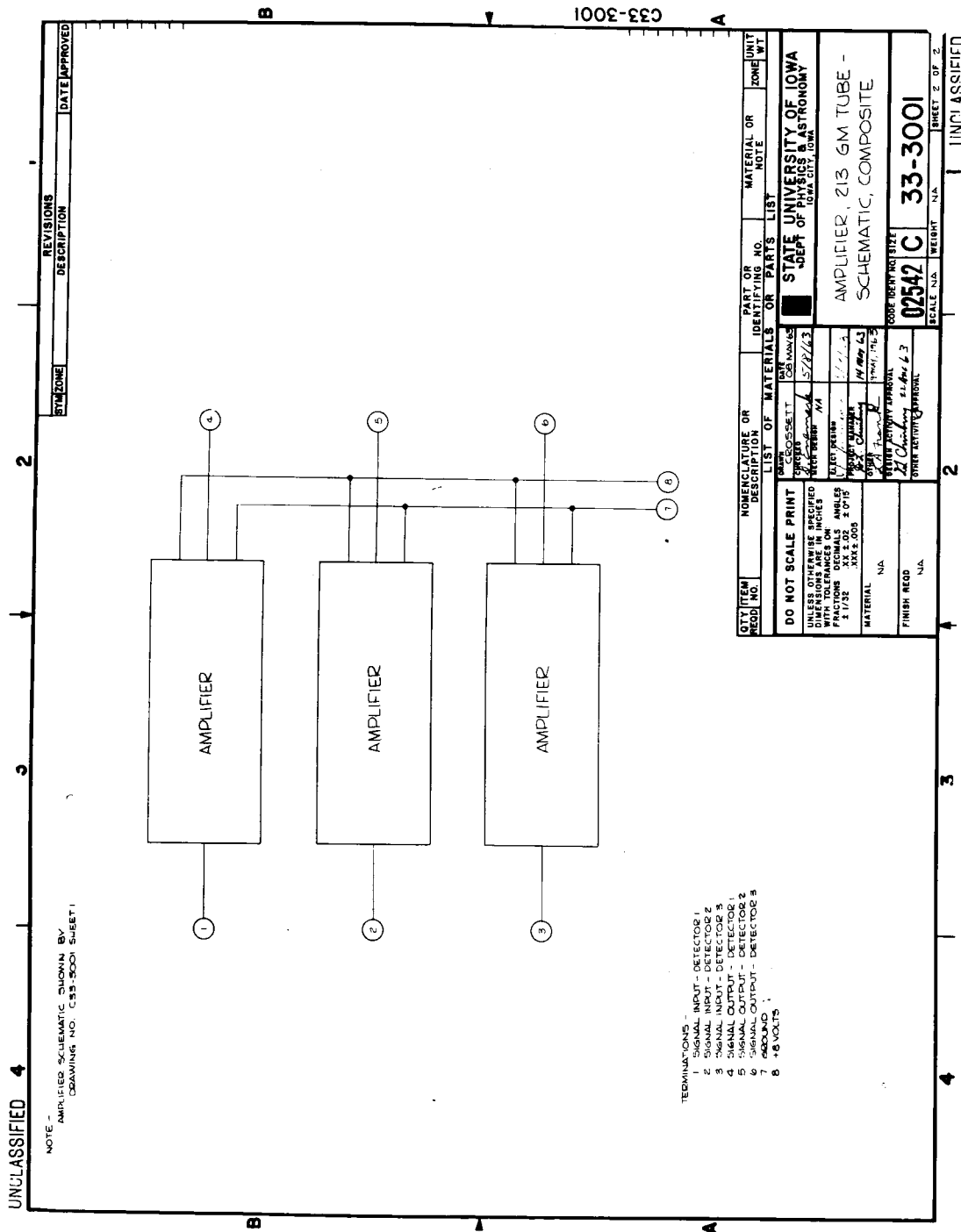
DO NOT SCALE PRINT		LIST OF MATERIALS OR PARTS LIST	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES XX ± .02 ± 0°15' XXX ± .005		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA	
MATERIAL NA		SUBASSY, CAP, PROTECTIVE - 213 GM, TYPE 0	
FINISH REQD NA		CODE IDENT NO. SIZE 02342 B 35-0023	
DESIGN ACTIVITY APPROVAL H. O. L. 10.2.63		SCALE 2/1 WEIGHT 374.6 SHEET 1 OF 1	
OTHER ACTIVITY APPROVAL		UNCLASSIFIED	

UNCLASSIFIED		2		B		A	
QTY/ITEM REQD NO.		NOMENCLATURE OR DESCRIPTION		PART OR IDENTIFYING NO.		MATERIAL OR NOTE	
DO NOT SCALE PRINT		LIST OF MATERIALS OR PARTS LIST		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA		CAP, PROTECTIVE - TYPE 6	
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' .XXX ± .005		DRAWN SPARKS CHECKED DATE 8/14/63 BY SP-13		ELECT DESIGN DATE 21 AUG 63 BY SP-13		MATERIAL MIG AZ31B-H24	
FINISH REQD SEE NOTES 1 & 2		DESIGN ACTIVITY APPROVAL DATE 10 OCT 63 BY CHUBBY		OTHER ACTIVITY APPROVAL		CODE IDENT NO SIZE 02542 B 35-0015	
2. SURFING PROTECTION PER JPL SPEC 90302-4 AFTER FINAL MACHINING.		SCALE 2/1		WEIGHT 212 G		SHEET 1 OF 1	
NOTES: 1. FAD UNLESS OTHERWISE SPECIFIED.		UNCLASSIFIED		2		INCLASSIFIED	

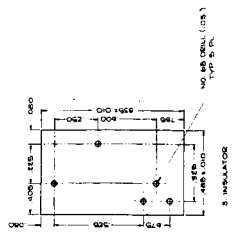
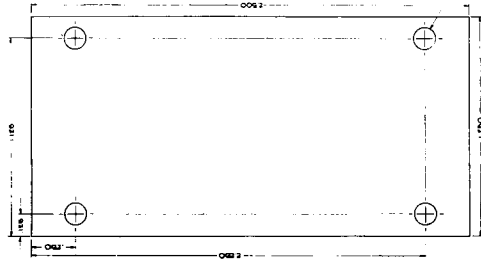
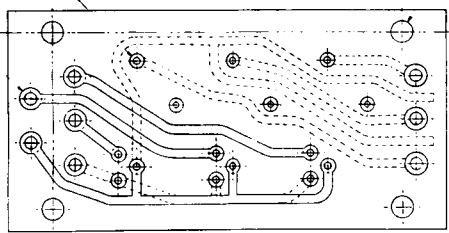
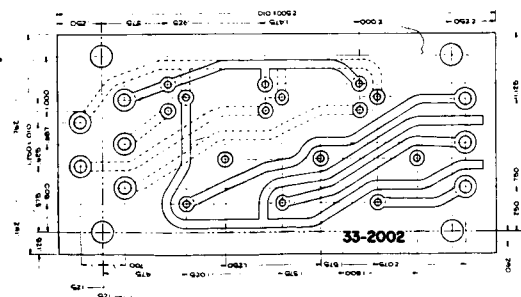
REVISIONS		DATE APPROVED	
SYN/ZONE	DESCRIPTION	DATE	APPROVED
A	CHANGED DIM. .900 TO .920, .866 TO .920, .100 TO .039, .975 TO .432. ADDD. 210, 105, 4531	2/10/64	[Signature]

CLASSIFICATION		2	
		<div style="display: flex; justify-content: space-between;"> B A </div>	
<div style="display: flex; justify-content: space-between;"> A B </div>			
REVISIONS		DATE APPROVED	
SYMBOL	DESCRIPTION	DATE	
A	CHANGED .925 TO .925 AND ADD .135 .545	8/07	
STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA			
BRACKET, CAP- 213 GM TYPE 6		35-0016	
075		SCALE 2/1	
075		WEIGHT 72 G	
075		SHEET 1 OF 1	
NOT APPROVED			
DO NOT SCALE PRINT		LIST OF MATERIALS OR PARTS LIST	
UNLESS OTHERWISE SPECIFIED: DIMENSIONS IN INCHES DECIMALS .01 FRACTIONS 1/32 ANGLES .01° TOLERANCES: .XX ± .02 .XXX ± .005		ITEM NO. DESCRIPTION QUANTITY DATE	
MATERIAL MAG. AZ31B-1/24		DESIGN ACTIVITY APPROVAL	
FINISH REQD SEE NOTES 1+2		OTHER ACTIVITY APPROVAL	
NOTES: 1. FAO 63 UNLESS OTHERWISE SPECIFIED.		2. SURFACE PROTECTION PER JPL SPEC 90502-4 AFTER FINAL MACHINING.	
2		2	





UNCLASSIFIED

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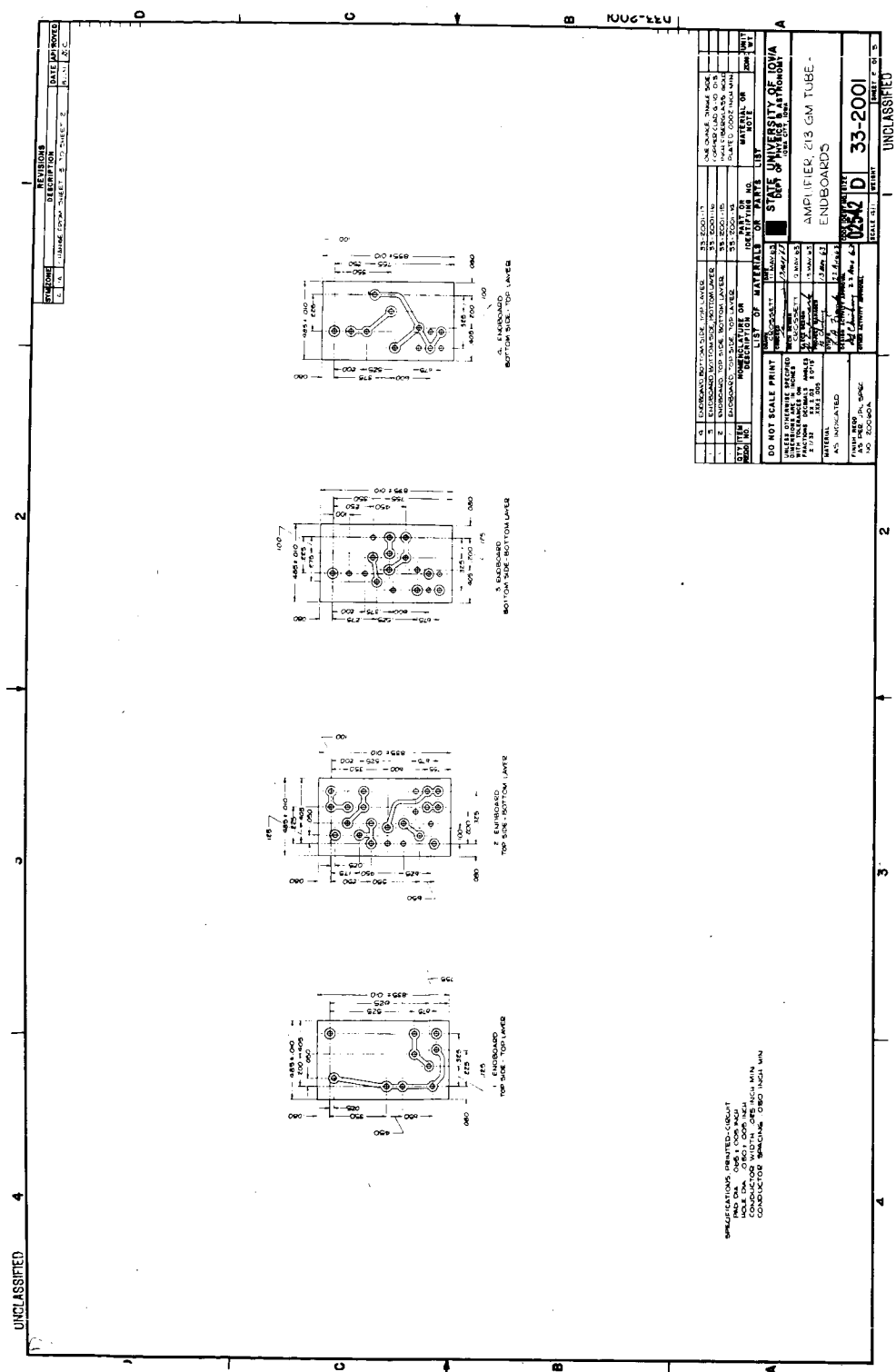
UNCLASSIFIED

SYMBOL		REVISIONS			
		DESCRIPTION	DATE APPROVED		
8	NA	TERMINAL, FORKED, GOLD PLATED	33-2002-4	LERCO X-5075-B	
1	NA	INSULATOR	33-2002-3	REF. D33-2002 SHEET 3	
3	NA	INSULATOR	33-2002-2	REF. D33-2002 SHEET 3	
1	NA	MOTHER BOARD	33-2002-1	REF. D33-2002 SHEET 3	
QTY REQD	ITEM NO.	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT WT

LIST OF MATERIALS OR PARTS LIST	
DO NOT SCALE PRINT	DATE 06 JUN 63
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES $\pm 1/32$.XX $\pm .02$ $\pm 0^{\circ}15'$.XXX $\pm .005$	CHECKED <i>[Signature]</i> 10 JUN 63
MATERIAL	MECH DESIGN NA
NA	ELECT DESIGN <i>[Signature]</i> 6/10/63
FINISH REQD	PROJECT MANAGER <i>[Signature]</i> 10 JUN 1963
NA	OTHER <i>[Signature]</i> NA
	DESIGN ACTIVITY APPROVAL <i>[Signature]</i> 22 Aug 63
	OTHER ACTIVITY APPROVAL

STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA	
AMPLIFIER ASSEMBLY, 213 GM TUBE - MATERIALS	
CODE IDENT NO. SIZE	72542 A LM33-2002
SCALE NA	WEIGHT
SHEET 1 OF 3	

UNCLASSIFIED



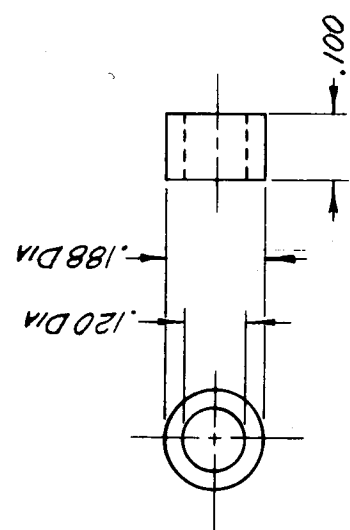
UNCLASSIFIED

2

SYN/ZONE		REVISIONS		DATE APPROVED	
		DESCRIPTION			
1	17	ENDBOARD, BOTTOM SIDE, TOP LAYER	33-2001-17	REF. D53-2001 SHEET 2	NA
1	16	ENDBOARD, BOTTOM SIDE, BOTTOM LAYER	33-2001-16	REF. D53-2001 SHEET 2	NA
1	15	ENDBOARD, TOP SIDE, BOTTOM LAYER	33-2001-15	REF. D53-2001 SHEET 2	NA
1	14	ENDBOARD, TOP SIDE, TOP LAYER	33-2001-14	REF. D53-2001 SHEET 2	NA
NA	13	WIPE, AN6 22, COPPER, SOLID	33-2001-13		NA
1	12	CAPACITOR, 3.3 μ F, 15V TANTALUM	33-2001-12	SPRAGUE 59003320015A2	NA
1	11	CAPACITOR, 220 pF, 200V CERAMIC	33-2001-11	VITRAMON CROSCONZELK	NA
1	10	RESISTOR, 1M, 1/4 WATT, 5%	33-2001-10	ALLEN-BRADLEY	NA
2	9	RESISTOR, 100K, 1/4 WATT, 5%	33-2001-9	ALLEN-BRADLEY	NA
1	8	RESISTOR, 18K, 1/4 WATT, 5%	33-2001-8	ALLEN-BRADLEY	NA
2	7	RESISTOR, 10K, 1/4 WATT, 5%	33-2001-7	ALLEN-BRADLEY	NA
2	6	RESISTOR, 47K, 1/4 WATT, 5%	33-2001-6	ALLEN-BRADLEY	NA
1	5	RESISTOR, 510 Ω , 1/4 WATT, 5%	33-2001-5	ALLEN-BRADLEY	NA
1	4	RESISTOR, 100 Ω , 1/4 WATT, 5%	33-2001-4	ALLEN-BRADLEY	NA
1	3	DIODE	33-2001-3	FAIRCHILD 1D295	NA
2	2	TRANSISTOR	33-2001-2	MOTOROLA 2N2222	NA
1	1	TRANSISTOR	33-2001-1	FAIRCHILD 2N995	NA
QTY	ITEM	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT
REQD	NO.				ZONE WT
LIST OF MATERIALS OR PARTS LIST					
DO NOT SCALE PRINT					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES .XX \pm .02 \pm 0°15' .XXX \pm .005					
MATERIAL					
NA					
FINISH REQD					
NA					
STATE UNIVERSITY OF IOWA DEPT. OF PHYSICS & ASTRONOMY 100 STELLAR LAB					
AMPLIFIER, 213 GM TUBE - LIST OF MATERIALS					
CODE IDENT NUMBER					
02542 B LM33-2001					
SCALE NA WEIGHT					
SHEET 1 OF 3					
UNCLASSIFIED					

BLM33-2001

UNCLASSIFIED

SYN		REVISIONS		DATE APPROVED	
DESCRIPTION		DESCRIPTION		DATE APPROVED	
<div></div>					
LIST OF MATERIALS OR PARTS LIST					
QTY	ITEM	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT WT
DO NOT SCALE PRINT					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± .015 .XXX ± .006					
MATERIAL		MAG AZ31B-H24			
FINISH REQD		63 ✓			
DRAWN SHAW, D.W.		13 AUG '63			
CHECKED		19 AUG '63			
DESIGN SHAW, D.W.		15 AUG '63			
ELECT DESIGN		22 AUG '63			
PROJECT MANAGER		19 AUG '63			
OTHER		CROSSETT			
DESIGN ACTIVITY APPROVAL		22 Aug 63			
OTHER ACTIVITY APPROVAL		22 Aug 63			
CODE IDENT NO		SIZE			
02542		A			
SCALE 4/1		WEIGHT			
SHEET 4/1		OF 1			
33-0004		UNCLASSIFIED			

STATE UNIVERSITY OF IOWA
DEPT OF PHYSICS & ASTRONOMY
IOWA CITY, IOWA

SPACER, ELECTRONICS-
UNIT 25

SYMBOL		REVISIONS		DATE APPROVED
		DESCRIPTION	CHG TERM. LOCATIONS & ADDED	
A		A-2	TERMINALS & CNG TITLE	5/1/65

NO.	FUNCTION
1	HIGH VOLTAGE NO. 1
2	HIGH VOLTAGE NO. 2
3	HIGH VOLTAGE NO. 3
4	A B Volts
5	GROUND NO. 1
6	GROUND NO. 2
7	A 75V (8" MAX. SW. MIN. SW.)
8	50 VOLTS
9	50 VOLTS

QTY	ITEM	NOMENCLATURE OR	IDENTIFYING NO.	PART OR	MATERIAL OR	UNIT
REQD	NO.	DESCRIPTION	ON	NO.	NOTE	WT
<div style="display: flex; justify-content: space-between;"> <div>DO NOT SCALE PRINT</div> <div>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY</div> </div>						
<div style="display: flex; justify-content: space-between;"> <div> <p>ALL DIMENSIONS SPECIFIED</p> <p>WITH TOLERANCES ON</p> <p>INCHES</p> <p>FRACTIONS</p> <p>XX ± .02</p> <p>XX ± .005</p> </div> <div> <p>REQUIREMENTS</p> <p>23mm-65</p> <p>23mm-65</p> <p>5/2/63</p> <p>23mm-65</p> </div> </div>						
<div style="display: flex; justify-content: space-between;"> <div> <p>MATERIAL</p> <p>N/A</p> </div> <div> <p>POWER SUPPLY -</p> <p>UNIT 25</p> </div> </div>						
<div style="display: flex; justify-content: space-between;"> <div> <p>FINISH REQD</p> <p>N/A</p> </div> <div> <p>02542 C 33-1002</p> </div> </div>						
<div style="display: flex; justify-content: space-between;"> <div> <p>NOTES:</p> <p>2. TERMINALS OUTLET MUST TO BE INSIDE SPECIFIED ENVELOPE</p> <p>3. 4 HOLES TO BE USED IN CLEARANCE FOR MOUNTING SEE CHG</p> <p>4. MINIMUM 1800 POUNDS COMPRESSION LOAD MIN.</p> </div> <div> <p>UNCLASSIFIED 1</p> </div> </div>						

APPLICATION

REQ. NO. 22825
 DATE 11-15-68
 DESIGNED BY J. J. JONES
 CHECKED BY J. J. JONES
 APPROVED BY J. J. JONES

REVISIONS

REV.	DATE	BY	DESCRIPTION
1	11-15-68	J. J. JONES	INITIAL DESIGN
2	11-15-68	J. J. JONES	REVISED TO MEET REQUIREMENTS

Top view of the terminal board showing dimensions and mounting holes.

Side view of the terminal board showing the profile and mounting holes.

Bottom view of the terminal board showing the internal layout and mounting holes.

NOTE

1. FROXY BOND ITEM 12, 8 & 9 TOGETHER.

2. INSERT THRU HOLE NO. 1, 2, 3 IN TERMINAL BOARD.

3. SOLDER IN HOLE NO. 1, 2, 3.

4. C22, C23, C24 ARE 003 uF INSTALLED IN MC-4 ONLY.

TERMINAL BOARD CHART

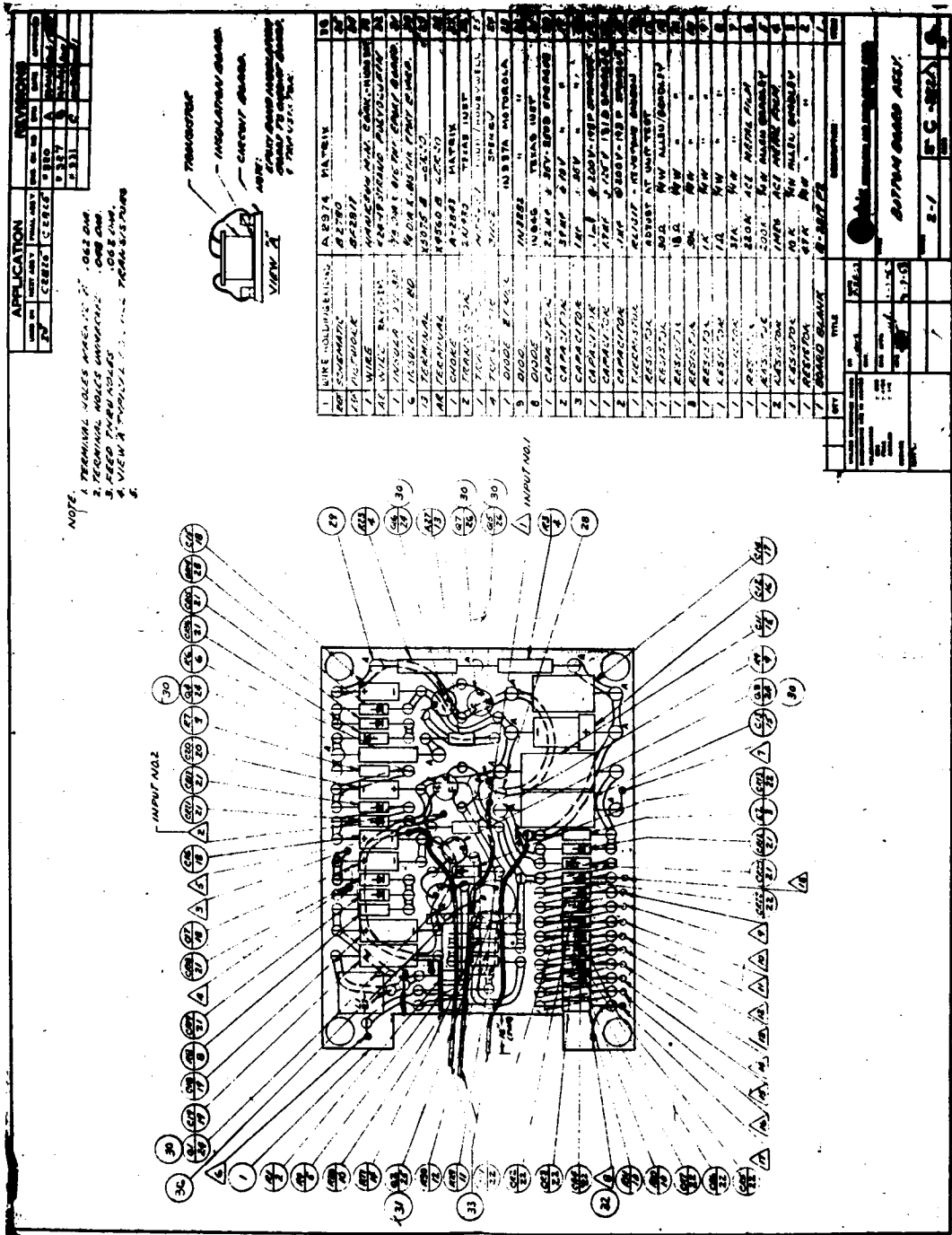
NO.	FUNCTION
1	HIGH VOLTAGE NO. 1
2	HIGH VOLTAGE NO. 2
3	HIGH VOLTAGE NO. 3
4	18V
5	GROUND NO. 1
6	GROUND NO. 2
7	125V
8	INPUT NO. 1
9	INPUT NO. 2

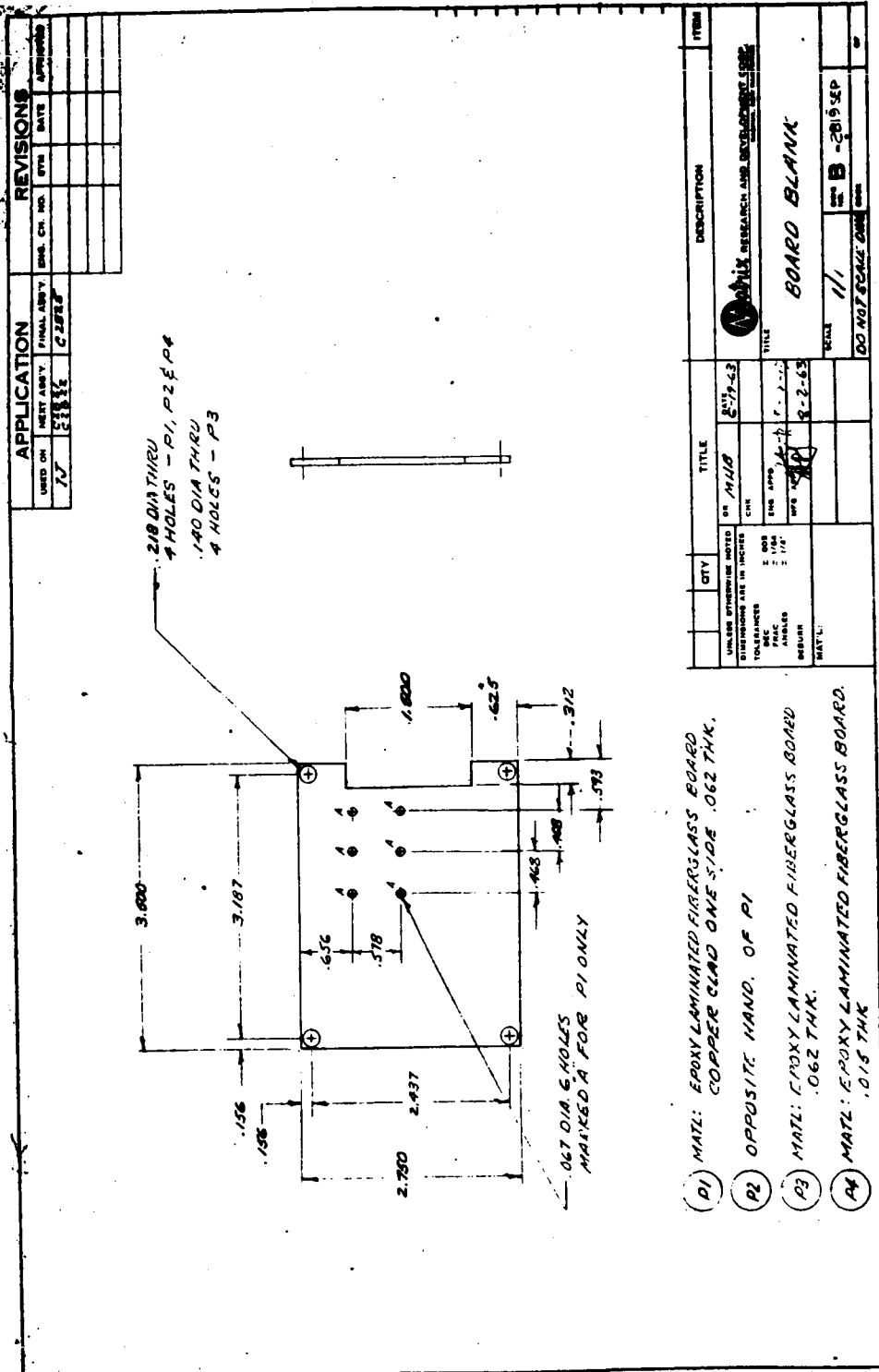
DESCRIPTION

ITEM	DESCRIPTION
1	TERMINAL BOARD
2	TERMINAL BOARD
3	TERMINAL BOARD
4	TERMINAL BOARD
5	TERMINAL BOARD
6	TERMINAL BOARD
7	TERMINAL BOARD
8	TERMINAL BOARD
9	TERMINAL BOARD

REVISIONS

REV.	DATE	BY	DESCRIPTION
1	11-15-68	J. J. JONES	INITIAL DESIGN
2	11-15-68	J. J. JONES	REVISED TO MEET REQUIREMENTS





APPLICATION			REVISIONS			
USED ON	NEXT ASS'Y.	FINAL ASS'Y.	ENG. CH. NO.	SYM	DATE	APPROVED
13	C2825	C2825				

.062 DIA THRU
3 HOLES


UNLESS OTHERWISE NOTED	DR SCHO	DATE 29 AUG 63	Matrix RESEARCH AND DEVELOPMENT CORP. <small>NABHUA, NEW HAMPSHIRE</small>	
DIMENSIONS ARE IN INCHES	CHK.			
TOLERANCES			TITLE WIRE HOLDING BRIDGE	
DEC ± .005	ENG APPD			
FRAC ± 1/64			SCALE 2/1	
ANGLES ± 1/4	MFG APPD			
DEBURR			DWG. NO. A-2974SEP	
MAT'L:				
EPOXY FIBER-GLASS BD			CODE	
			OF	

APPLICATION				REVISIONS			
USED ON	NEXT ASS'Y.	FINAL ASS'Y.	ENG. CH. NO.	SYM	DATE	APPROVED	
LJ	C2825	C2825					


MATERIAL: 6061 T6 ALUM

UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES TOLERANCES DEC .005 FRAC 1/64 ANGLES 1/4 DEBURR	DR. <i>H.S.</i>	DATE 6-17-63	Matrix RESEARCH AND DEVELOPMENT CORP. <small>NASHUA, NEW HAMPSHIRE</small> TITLE <h1 style="margin: 0;">INSERT</h1>
	CHK.		
	ENG APP'D <i>H.S.</i>	8-2-63	
	MFG APP'D <i>R.B.</i>	9/17/63	
		SCALE 2-1	A-2801 SEP
			OF

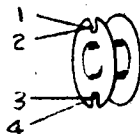
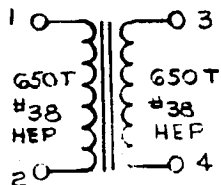
APPLICATION			REVISIONS			
VERSION	NEXT ASS'Y.	FINAL ASS'Y.	ENG. CH. NO.	SYM	DATE	APPROVED
1J	02821	02825				



1. BOBBIN: E-463
2. LAMINATIONS: EE 30-31 (EE 094-A026-A6)
3. USE SELF LEADS.
4. #56 MYLAR TAPE TO HOLD LEADS IN POSITION & TO HOLD CORE TOGETHER
5. RESISTANCE 1-2 0.9Ω.


UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES TOLERANCES DEC. ± .008 FRAC. ± 1/64 ANGLES ± 1/4° DESURR	DR	MHB	DATE	2-8-63	 Matrix RESEARCH AND DEVELOPMENT CORP. <small>NASHUA, NEW HAMPSHIRE</small>
	CHK.				
	ENG. APPD.	JMR	8-7-63	TITLE	
	MFG. APPD.	SM	7-7-63	CHOKE	
	SCALE	NONE	DWG. NO.	A-2843	
			CODE		OF

APPLICATION			REVISIONS			
USED ON	NEXT ASS'Y.	FINAL ASS'Y.	ENG. CH. NO.	SYM	DATE	APPROVED
15			320	A	7-2-63	W.H. / J.P.



NOTES:

1. BOBBIN #2-5665-A OR 1-5666-B (SEE ABOVE)
2. CORE: CF-213 (TI) WHITE-BLUE DOTS
3. WIND PRIMARY AND FOLLOW WITH SECONDARY
USE #38 HEP FOR BOTH WINDINGS (650T)
USE #31 HEP WITH TEFLON SLEEVING FOR LEADS
4. WIND 650 TURNS OF #38 HEP AS IN NOTE 3
BUT USE TWO LAYERS OF NO. 20 PLASTIC TAPE BETWEEN WINDINGS - VACUUM IMPREGNATE - PRIMARY LEADS TO COME OUT ONE HOLE - SAME FOR SECONDARY - USE HOLES ON ONE SIDE ONLY

UNLESS OTHERWISE NOTED	DR. SCHO	DATE 30 AUG 63	 Matrix RESEARCH AND DEVELOPMENT CORP. 100 N. MAIN ST. NASHUA, NEW HAMPSHIRE
DIMENSIONS ARE IN INCHES	CHK.		
TOLERANCES	ENG. APPD.	1-2-63	TITLE TOROID
DEC. 1/64 FRACTION ANGLES 1/4"	MFG. APPD.	10-8-63	
DEBURR			SCALE
MAT'L.			NONE
			FILE # 2824

APPLICATION				REVISIONS			
USED ON	NEXT ASS'Y.	FINAL ASS'Y.	ENG. CH. NO.	SYM	DATE	APPROVED	
13	C2822	C2825	320	A	9-2-63	<i>[Signature]</i>	

PRI (2) (3) SEC #1
 1 0 3
 1080T #44 HEP
 04
 1080T
 2 0 5
 06
 255T
 07
 255T #36 HEP
 08 BIFILAR
SEC #2
 (1)

NOTES

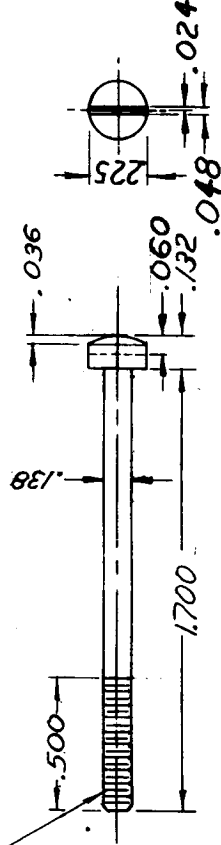
1. CORE: 51033-1F / MAGNETICS INC
2. USE #56 MYLAR TAPE (ONE LAYER) ON CORE
3. SECONDARY #2 > 1/2 OF CORE
PRIMARY < 1/2 OF CORE
4. WINDING SEQUENCE (1) (2) (3)
5. WIND WITH ONE LAYER #20 PLASTIC TAPE AND WIND (3) AS CAREFULLY AS POSSIBLE LEAVING ABOUT 2 1/8" WINDOW
6. CHANGE LEADS TO RET. 24(19) 3 1/2" LONG
7. TAPE COMPLETED TRANSFORMER WITH #56 MYLAR
8. VACUUM IMPREGNATE AFTER WINDING (2) AND AFTER (3)
- 9 RESISTANCE:

1-2	120Ω
5-4	340Ω
5-3	1100Ω
7-6	10.0Ω
7-8	10.0Ω

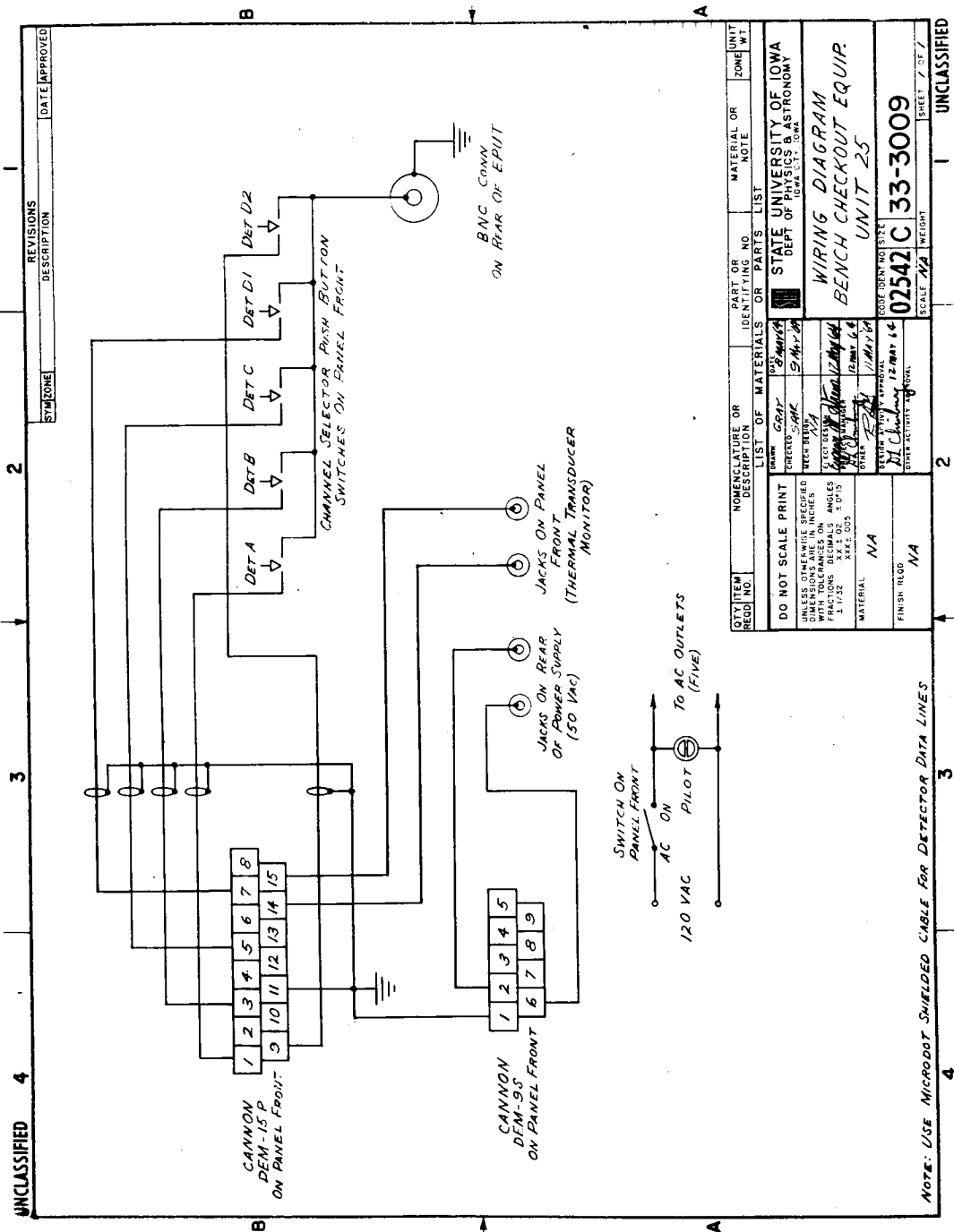
UNLESS OTHERWISE NOTED DIMENSIONS ARE IN INCHES TOLERANCES DEC. = .008 FRAC. = 1/64 ANGLES = 1/4" DESURR MAT'L:	DR. SCHO	DATE 3 SEP 63	Matrix RESEARCH AND DEVELOPMENT CORP. <small>NASHUA, NEW HAMPSHIRE</small> TITLE TOROID SCALE NONE			
	CHK.					
	ENG. APPD. <i>[Signature]</i>	9-2-				
	MFG. APPD. <i>[Signature]</i>	10-8-63				
				DRG. NO. A-2845	A	
				CORE	OF	

UNCLASSIFIED

50

SYN		REVISIONS		DATE APPROVED	
DESCRIPTION		DESCRIPTION		DATE APPROVED	
<p>6-32 UNC-3A</p>  <p>2.FAO 13Y UNLESS OTHERWISE SPECIFIED.</p> <p>NOTES: 1. REMOVE ALL BURRS AND SHARP EDGES.</p>					
LIST OF MATERIALS OR PARTS LIST					
QTY	ITEM	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT WT
DO NOT SCALE PRINT					
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 .XX ± .02 ± 0°15' XXX ± .005					
MATERIAL STAINLESS STEEL					
FINISH REQD A-286					
SEE NOTES 2#2					
DRAWN: H. G. D. 17 DATE: 2 SEPT 63					
CHECKED: [Signature] DATE: 30 SEP 63					
MECH DESIGN: [Signature] DATE: 27 SEP 63					
ELECT DESIGN: [Signature] DATE: 30 SEP 63					
PROJECT MANAGER: [Signature] DATE: 30 SEP 63					
OTHER: [Signature]					
DESIGN ACTIVITY APPROVAL: [Signature] DATE: 30 SEP 63					
OTHER ACTIVITY APPROVAL: [Signature]					
CODE IDENT NO. SIZE 02542 A 33-0007					
SCALE 2/1 WEIGHT SHEET / OF /					

UNCLASSIFIED



QTY	ITEM	NO.	DESCRIPTION	OR PARTS LIST	IDENTIFYING NO.	MATERIAL OR NOTE	UNIT
LIST OF MATERIALS							
DO NOT SCALE PRINT							
UNLESS OTHERWISE SPECIFIED							
DIMENSIONS ARE IN INCHES							
FRACTIONS DECIMALS ANGLES							
1 1/32 .001 0° 15'							
MATERIAL							
FINISH							
SCALE							
SHEET							

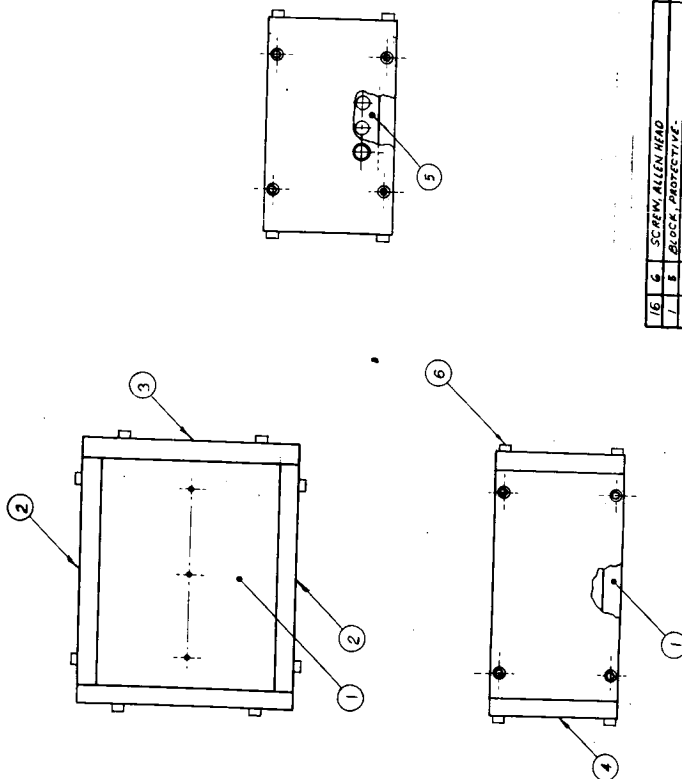
STATE UNIVERSITY OF IOWA
DEPT. OF PHYSICS & ASTRONOMY
1048 LST. IOWA

WIRING DIAGRAM
BENCH CHECKOUT EQUIP
UNIT 25

CODE IDENT NO. 02542 C 33-3009

SCALE 1/8" = 1"

SHEET 1 OF 1

[illegible][illegible]

UNCLASSIFIED

2

SYNOPSIS		REVISIONS		DATE APPROVED	
DESCRIPTION		DESCRIPTION		DATE APPROVED	
<p>2.750 1.750 2.50 350 TIP 1.750 2.800 3.500 350 TIP 4-40 UNC 2B x .300 DEEP, 8 HOLES. .125 .250</p>		PART OR IDENTIFYING NO.		MATERIAL OR NOTE	
		LIST OF MATERIALS OR PARTS LIST		UNIT WT	
DO NOT SCALE PRINT		STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA			
UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 ± .015 ± 10'		COVER, SIDE A-AND E - ENCAPSULATION HQ UNIT 25			
MATERIAL		AL			
FINISH REQ		SEE NOTE 1			
NOTES: 1. FNO 2. REMOVE ALL BURRS AND SHARP EDGES.		SCALE 1/1		SHEET 1 OF 1	

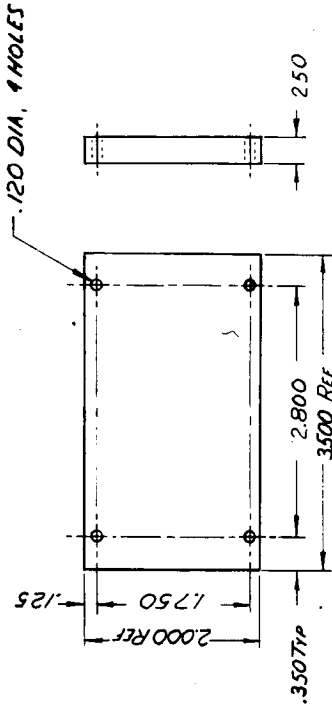
UNCLASSIFIED

2

UNCLASSIFIED

2

QTY/ITEM REQD NO.		NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT ZONE WT															
		<table border="1"> <tr> <td>SYMBOL</td> <td>REVISIONS DESCRIPTION</td> <td>DATE APPROVED</td> </tr> <tr> <td></td> <td></td> <td></td> </tr> </table>				SYMBOL	REVISIONS DESCRIPTION	DATE APPROVED												
SYMBOL	REVISIONS DESCRIPTION	DATE APPROVED																		
<p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES ± 1/32 ± .005 ± 0°15 ± .001 ± .000</p> <p>MATERIAL AL</p> <p>FINISH REQD SEE NOTE 1</p>																				
<p>2. REMOVE ALL BURRS AND SHARP EDGES.</p> <p>NOTES: 1. F.A.O. UNLESS OTHERWISE SPECIFIED.</p>																				
<p>LIST OF MATERIALS OR PARTS LIST</p> <table border="1"> <tr> <td>WARRANTY</td> <td>6000-1</td> <td>25 Mac 63</td> </tr> <tr> <td>CHECKED</td> <td>25 Mac 63</td> <td>25 Mac 63</td> </tr> <tr> <td>TECH DESIGN</td> <td>25 Mac 63</td> <td>25 Mac 63</td> </tr> <tr> <td>FLYER DESIGN</td> <td>25 Mac 63</td> <td>25 Mac 63</td> </tr> <tr> <td>OTHER</td> <td>25 Mac 63</td> <td>25 Mac 63</td> </tr> </table>						WARRANTY	6000-1	25 Mac 63	CHECKED	25 Mac 63	25 Mac 63	TECH DESIGN	25 Mac 63	25 Mac 63	FLYER DESIGN	25 Mac 63	25 Mac 63	OTHER	25 Mac 63	25 Mac 63
WARRANTY	6000-1	25 Mac 63																		
CHECKED	25 Mac 63	25 Mac 63																		
TECH DESIGN	25 Mac 63	25 Mac 63																		
FLYER DESIGN	25 Mac 63	25 Mac 63																		
OTHER	25 Mac 63	25 Mac 63																		
<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>COVER, SIDE B AND F - ENCAPSULATION MOLD, UNIT 25</p>																				
<p>CODE IDENTIFYING NO. U2542 B 33-0010</p> <p>SCALE 1/1 WEIGHT SHEET 1 OF 1</p>																				



2

UNCLASSIFIED

UNCLASSIFIED

2

1

2

UNCLASSIFIED

SYN

ZONE

REVISIONS

DESCRIPTION

DATE

APPROVED

2500 DIA

125 TIP

120 DIA, 4 HOLES

2000

3250 REF

600

2050

250

75

QTY

ITEM

REQD

NO.

NOMENCLATURE OR DESCRIPTION

PART OR IDENTIFYING NO.

MATERIAL OR NOTE

UNIT

ZONE

WT

DO NOT SCALE PRINT

UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS .XX ± .02 ANGLES ± 1° 32' DECIMALS .XXX ± .005

MATERIAL AL

FINISH REQD SEE NOTE 1

DRAWN BY

CHECKED

DESIGNED BY

ELECT DESIGN

WORK DRAWN

OTHER

DATE

25 SEP 63

25 SEP 63

25 SEP 63

25 SEP 63

25 SEP 63

25 SEP 63

STATE UNIVERSITY OF IOWA

DEPT OF PHYSICS & ASTRONOMY

IOWA CITY, IOWA

COVER, SIDE C -

ENCAPSULATION MOLD, UNIT 25

CODE IDENT NO. 124

02542 B

33-0011

SCALE

ROLL

WEIGHT

SHEET

OF

1

2. REMOVE ALL BURRS AND SHARP EDGES.

NOTES: 1. FAO UNLESS OTHERWISE SPECIFIED.

UNCLASSIFIED

2

1

2

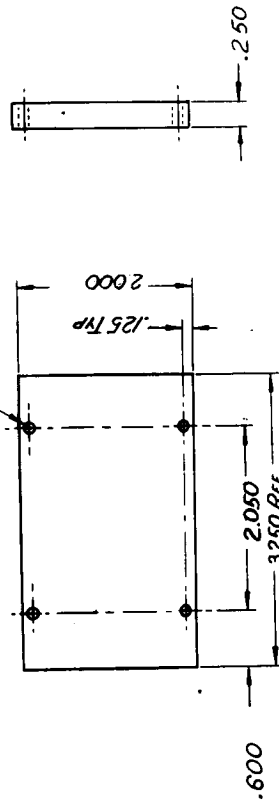
UNCLASSIFIED

UNCLASSIFIED

2

SYMBOL	REVISIONS	DATE	APPROV.
	DESCRIPTION		

-120 DIA. 4 HOLES

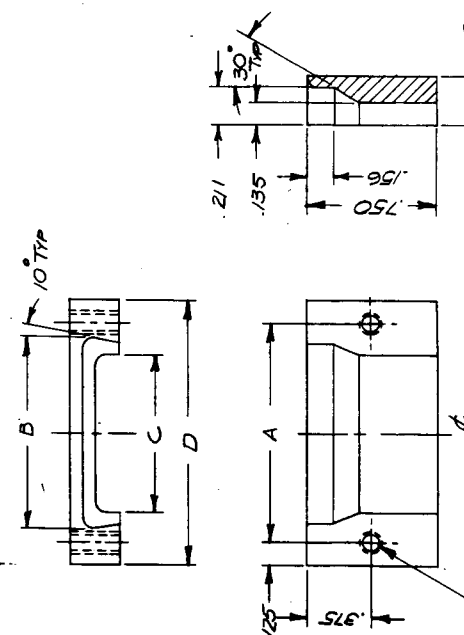


QTY ITEM REQD NO.	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT REQD WT
LIST OF MATERIALS OR PARTS LIST				
STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOVA CITY, IOWA				
COVER, SIDE D - ENCAPSULATION MOLD, UNIT 25				
02542 B 33-0012				
SCALE 1/2" = 1"				
WEIGHT 1.000 LB				
FINISH REQD SEE NOTE 1				
DO NOT SCALE PRINT UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS .XX ± .02 DECIMALS .XX ± .01 ANGLES ± 1/32 HOLE DIA. ± .005				
MATERIAL AL 7075-T6				
FINISH REQD SEE NOTE 1				
NOTES: 1. FAO BY UNLESS OTHERWISE SPECIFIED.				

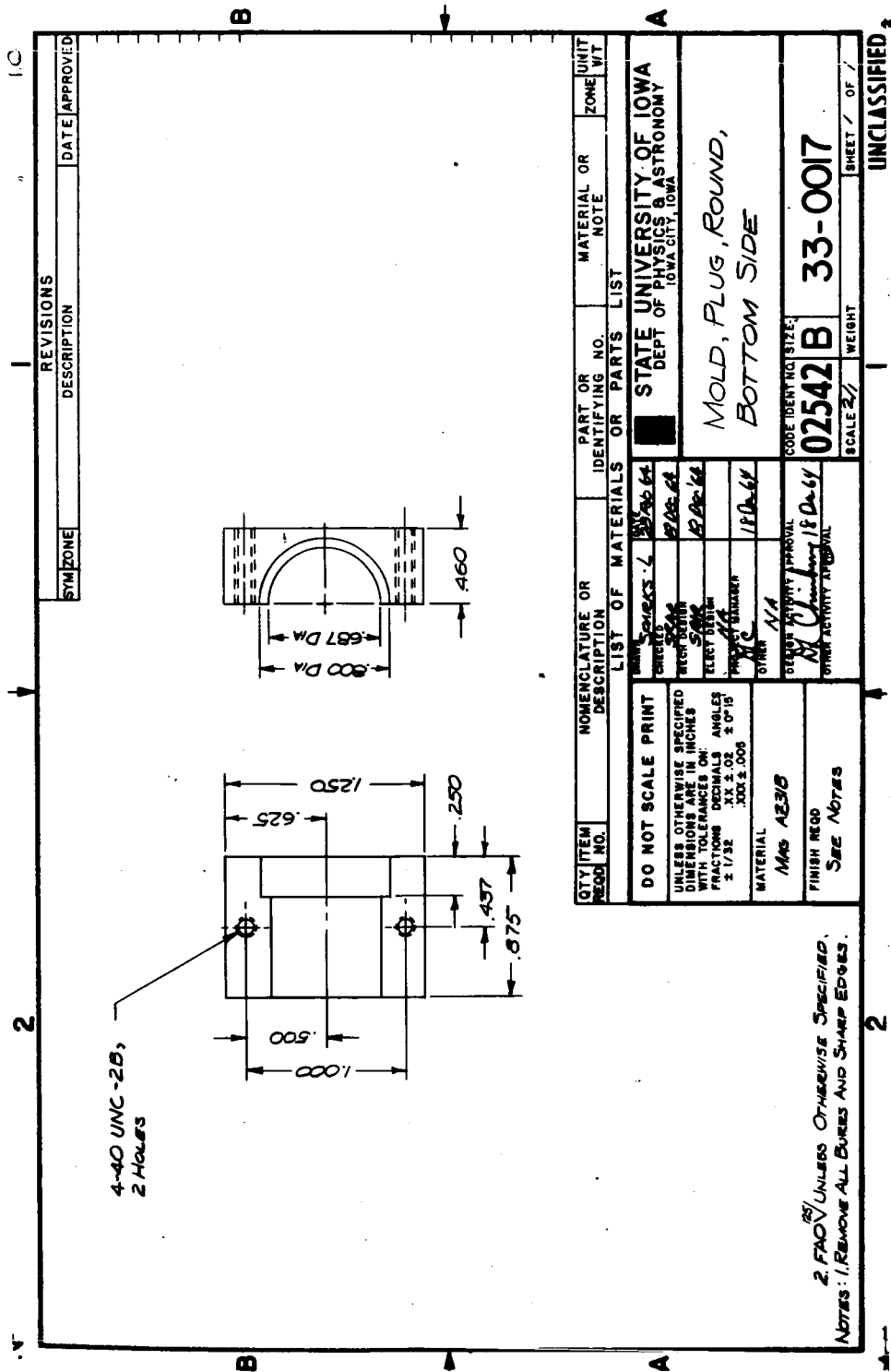
2. REMOVE ALL BURRS AND SHARP
EDGES.

NOTES: 1. FAO BY UNLESS OTHERWISE SPECIFIED.

2

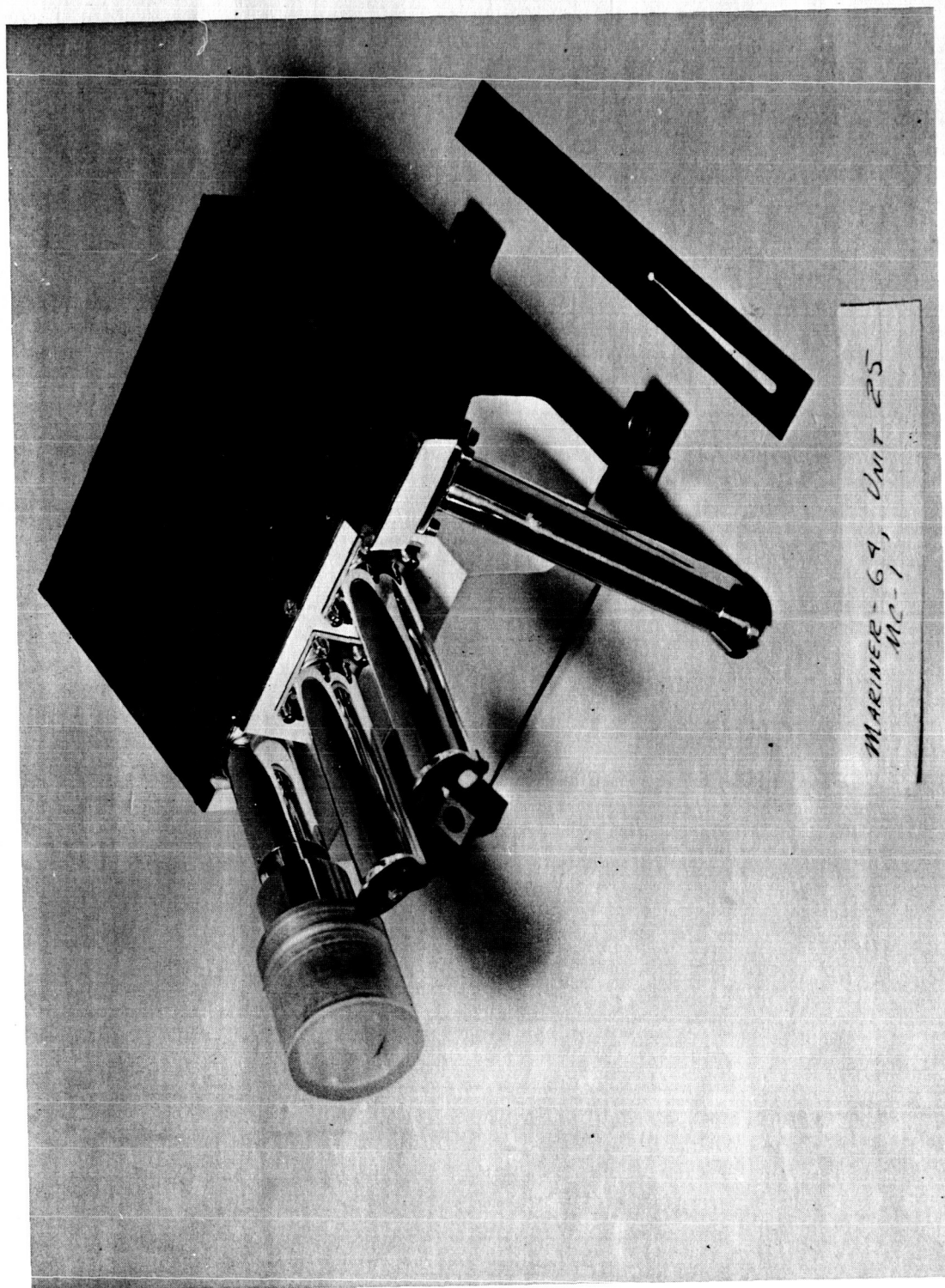
SYNOPSIS		REVISIONS		DATE APPROVED																										
DESCRIPTION		DESCRIPTION		DATE APPROVED																										
		<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>Dim.</th> <th>9 PIN</th> <th>15 PIN</th> </tr> </thead> <tbody> <tr> <td>A</td> <td>.937</td> <td>1.250</td> </tr> <tr> <td>B</td> <td>.750</td> <td>1.000</td> </tr> <tr> <td>C</td> <td>.575</td> <td>.897</td> </tr> <tr> <td>D</td> <td>1.187</td> <td>1.500</td> </tr> </tbody> </table>		Dim.	9 PIN	15 PIN	A	.937	1.250	B	.750	1.000	C	.575	.897	D	1.187	1.500	<table border="1" style="width: 100%; border-collapse: collapse;"> <thead> <tr> <th>QTY/ITEM</th> <th>NOMENCLATURE OR DESCRIPTION</th> <th>PART OR IDENTIFYING NO.</th> <th>MATERIAL OR NOTE</th> <th>UNIT</th> </tr> </thead> <tbody> <tr> <td>1</td> <td>MOLD - 9 & 15 PIN, TOP SIDE</td> <td></td> <td></td> <td>WT</td> </tr> </tbody> </table>		QTY/ITEM	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT	1	MOLD - 9 & 15 PIN, TOP SIDE			WT
Dim.	9 PIN	15 PIN																												
A	.937	1.250																												
B	.750	1.000																												
C	.575	.897																												
D	1.187	1.500																												
QTY/ITEM	NOMENCLATURE OR DESCRIPTION	PART OR IDENTIFYING NO.	MATERIAL OR NOTE	UNIT																										
1	MOLD - 9 & 15 PIN, TOP SIDE			WT																										
<p>4.40 UNC-2B 2 HOLES</p>		<p>STATE UNIVERSITY OF IOWA DEPT. OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p>		<p>UNCLASSIFIED</p>																										
<p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES XX ± .02 ± 0°15 ± 1/32 .001 ± .005</p> <p>MATERIAL Teflon</p> <p>FINISH REQ SEE NOTE 2</p>		<p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES ON: FRACTIONS DECIMALS ANGLES XX ± .02 ± 0°15 ± 1/32 .001 ± .005</p> <p>MATERIAL Teflon</p> <p>FINISH REQ SEE NOTE 2</p>		<p>CODE IDENTIFYING NO.</p> <p>02542B</p> <p>SCALE 2/1 WEIGHT</p> <p>33-0020</p> <p>SHEET 1 OF 1</p>																										
<p>2. REMOVE ALL BURRS AND SHARP EDGES.</p> <p>NOTES: 1. ALL RADII .06 UNLESS OTHERWISE SPECIFIED.</p>		<p>2. REMOVE ALL BURRS AND SHARP EDGES.</p> <p>NOTES: 1. ALL RADII .06 UNLESS OTHERWISE SPECIFIED.</p>		<p>2. REMOVE ALL BURRS AND SHARP EDGES.</p> <p>NOTES: 1. ALL RADII .06 UNLESS OTHERWISE SPECIFIED.</p>																										

SYN ZONE		REVISIONS		DATE APPROVED	
DESCRIPTION		DESCRIPTION		DATE APPROVED	
		<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>MOLD - 9 1/2" PIN, BOTTOM SIDE</p>			
<p>DO NOT SCALE PRINT</p> <p>UNLESS OTHERWISE SPECIFIED DIMENSIONS ARE IN INCHES WITH TOLERANCES OF: FRACTIONS DECIMALS ANGLES ± 1/32 ± .005 ± 0°15'</p>		<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>MOLD - 9 1/2" PIN, BOTTOM SIDE</p>			
<p>MATERIAL</p> <p>NA</p>		<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>MOLD - 9 1/2" PIN, BOTTOM SIDE</p>			
<p>FINISH REQD</p> <p>SEE NOTE 2</p>		<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>MOLD - 9 1/2" PIN, BOTTOM SIDE</p>			
<p>2 REMOVE ALL BURRS AND SHARP EDGES. NOTES: 1. ALL ROUNDS UNLESS OTHERWISE SPECIFIED</p>		<p>STATE UNIVERSITY OF IOWA DEPT OF PHYSICS & ASTRONOMY IOWA CITY, IOWA</p> <p>MOLD - 9 1/2" PIN, BOTTOM SIDE</p>			



Appendix II

P H O T O G R A P H S

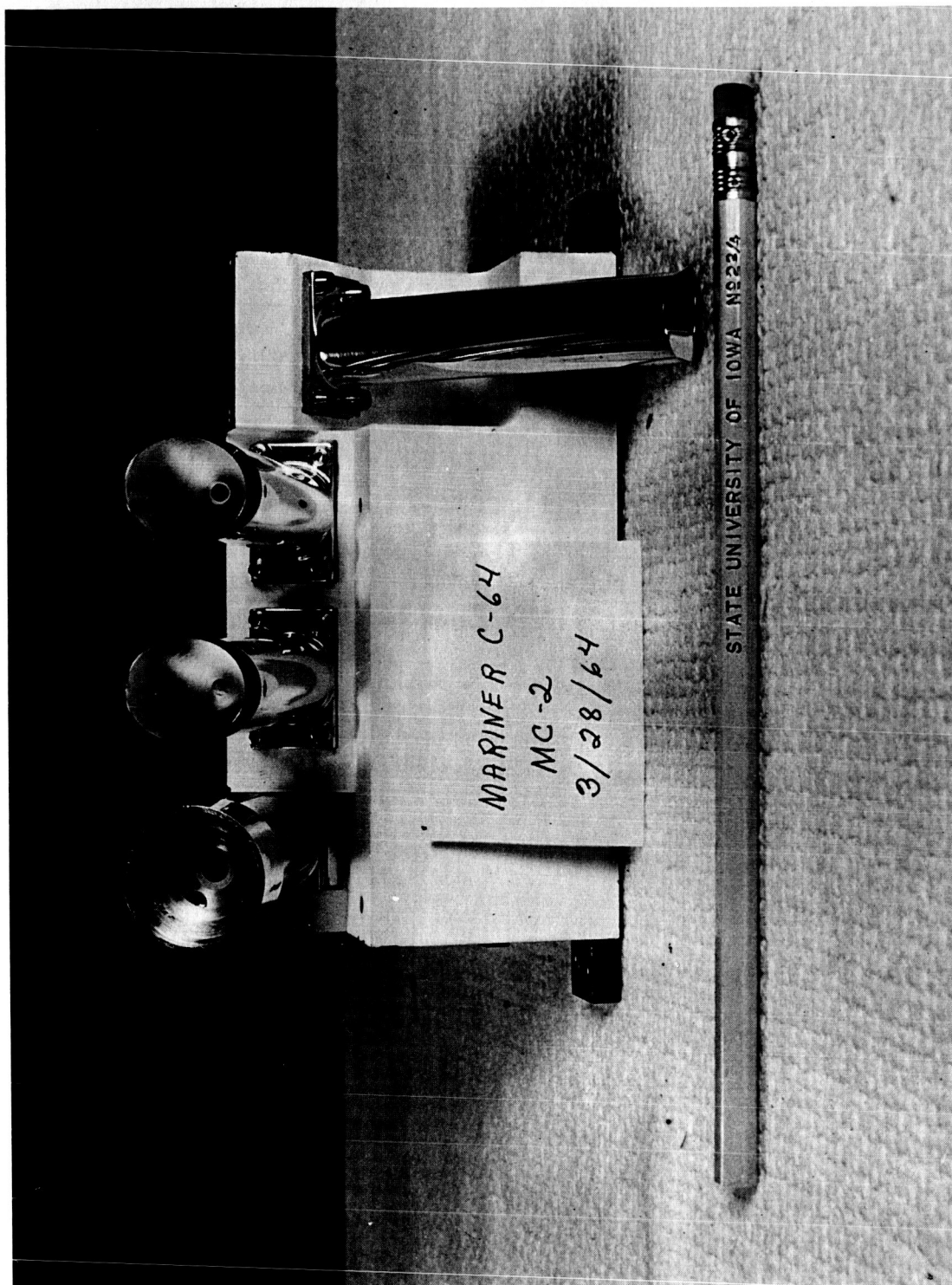


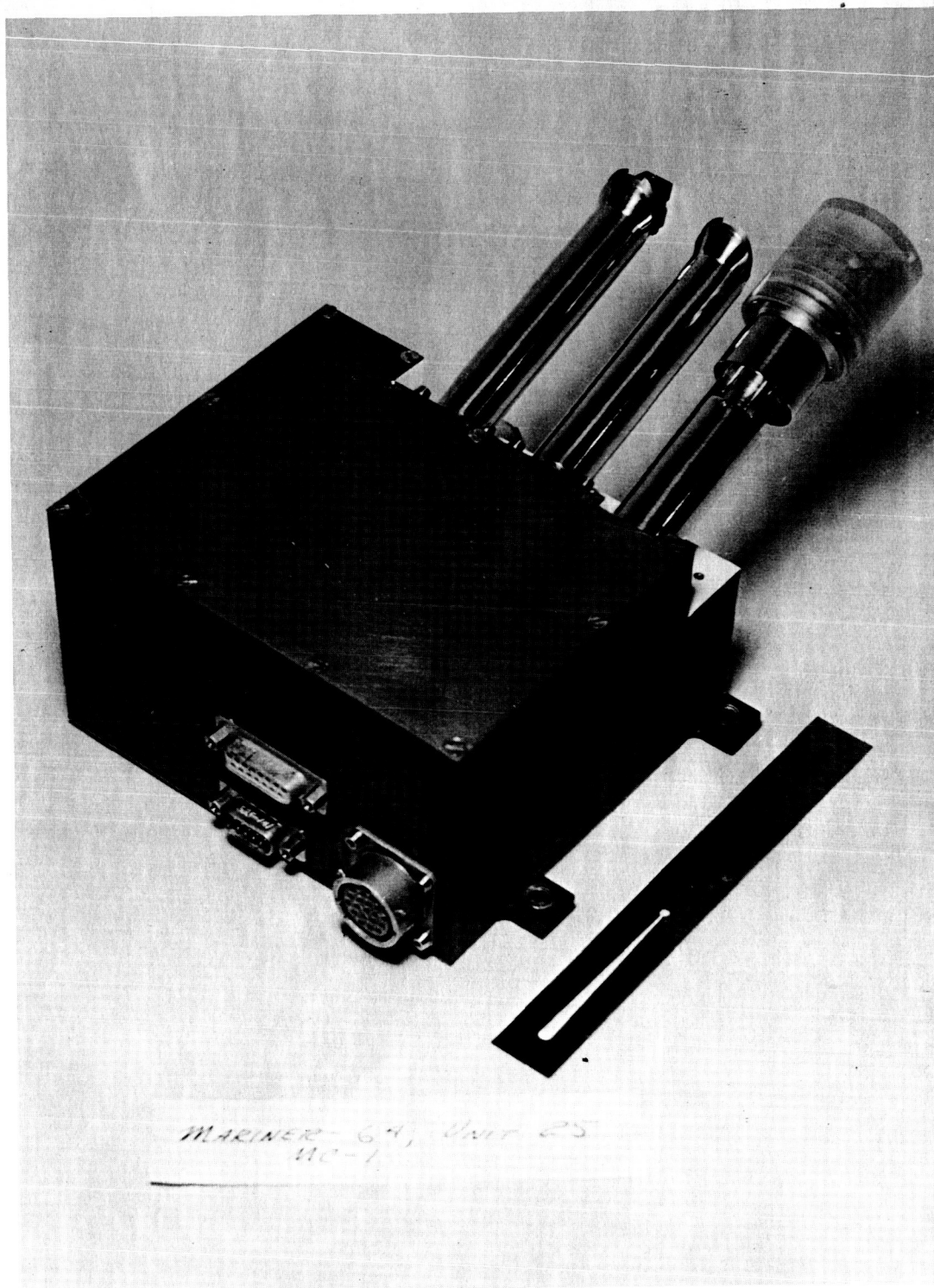
MARINER C-64

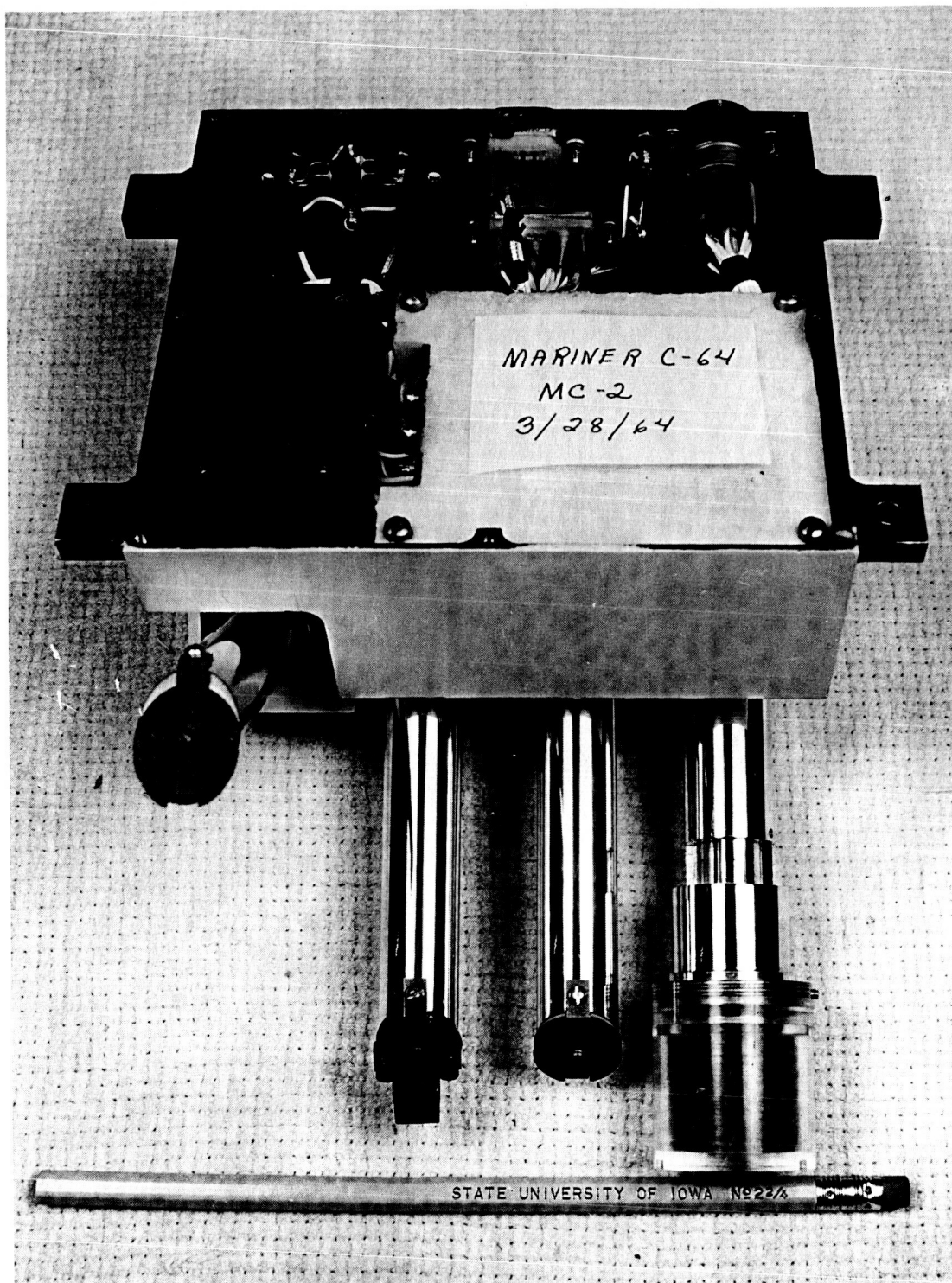
MC-2

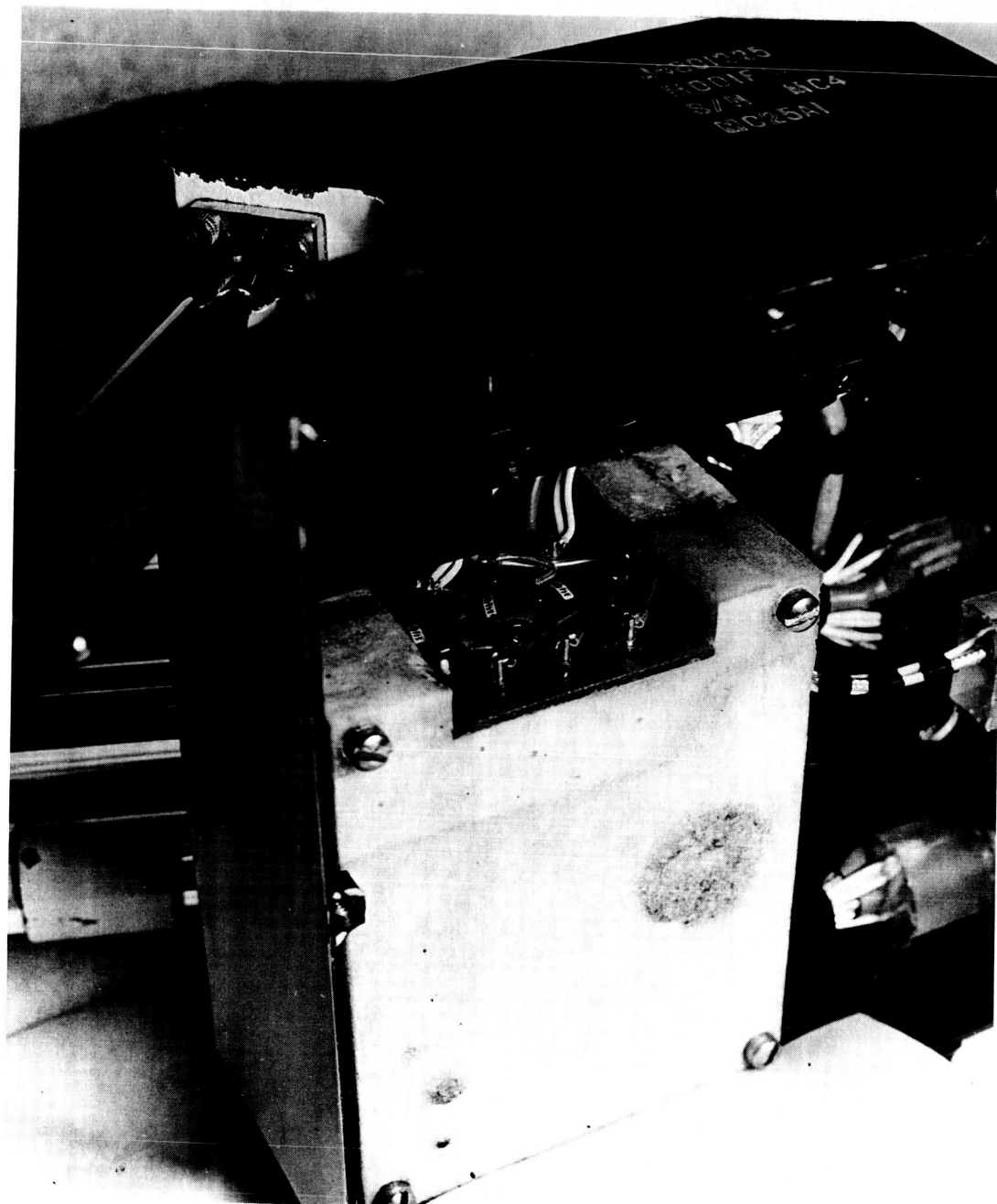
3/28/64

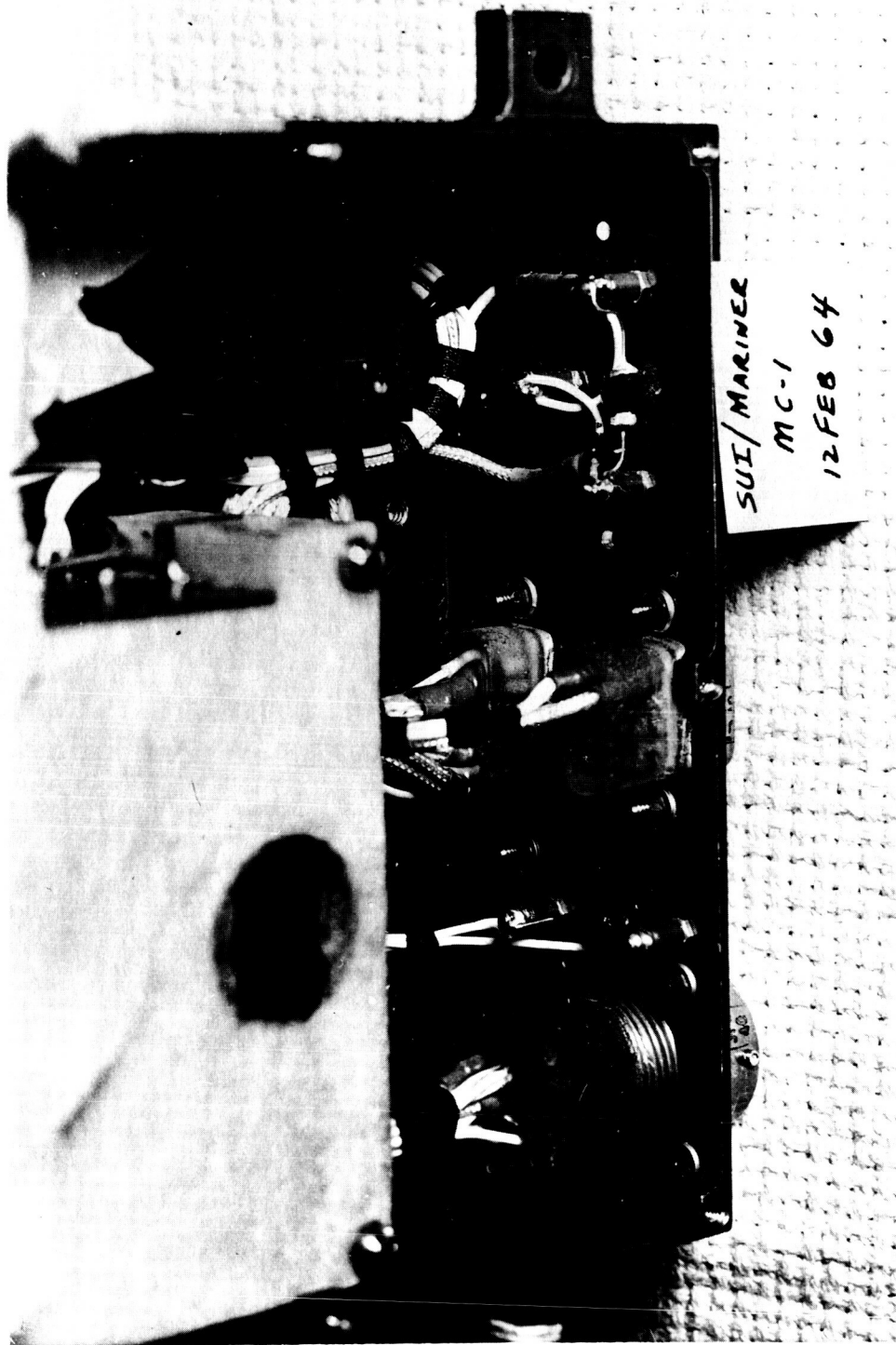
STATE UNIVERSITY OF IOWA N2224

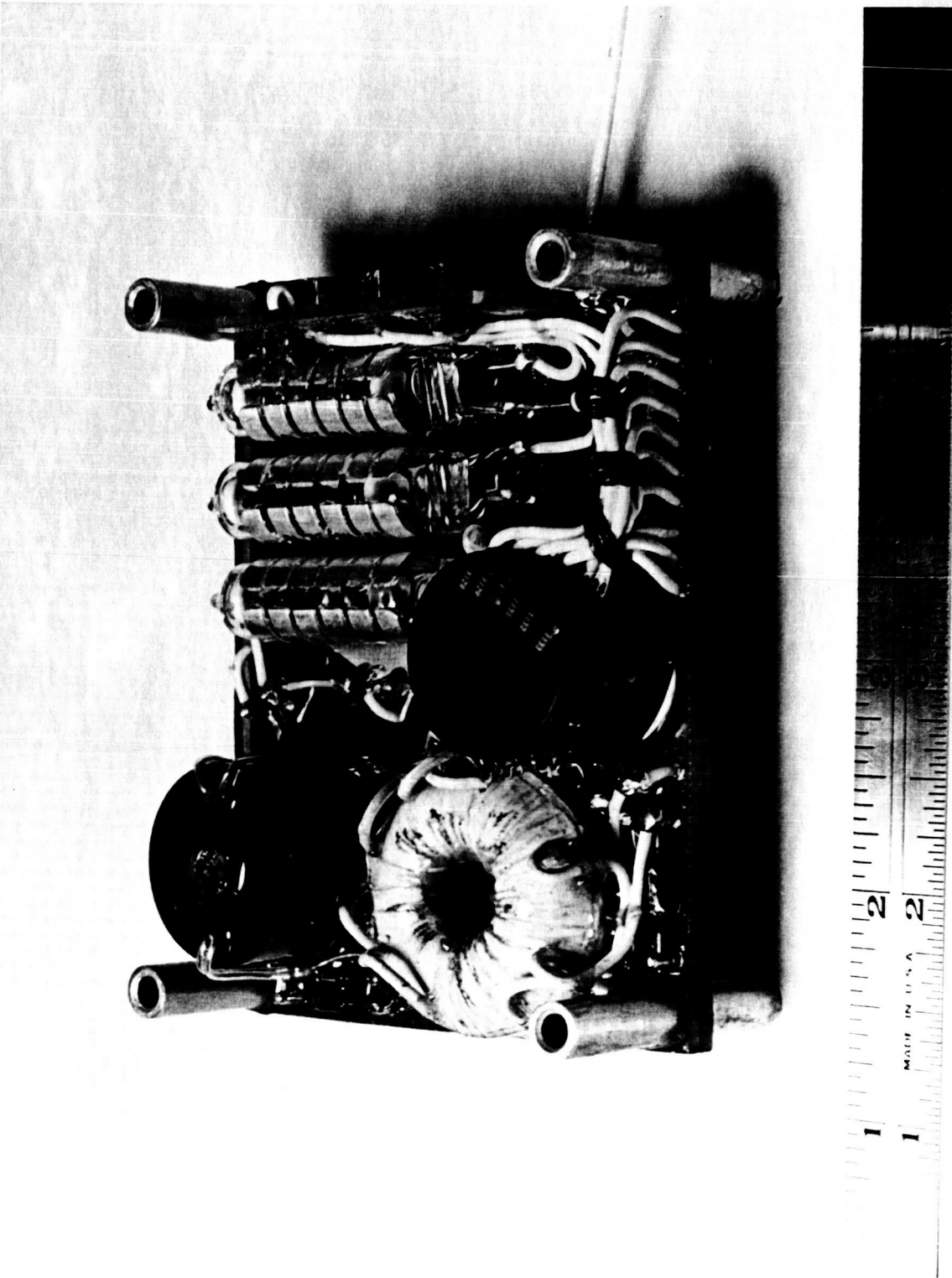


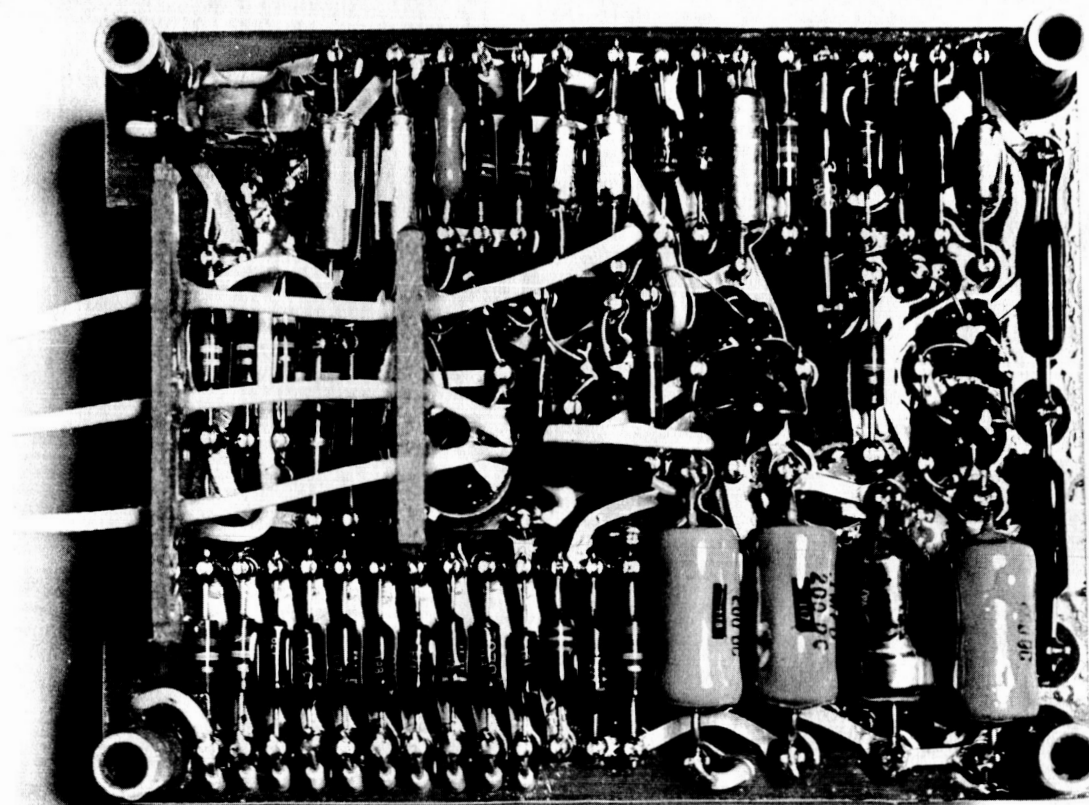




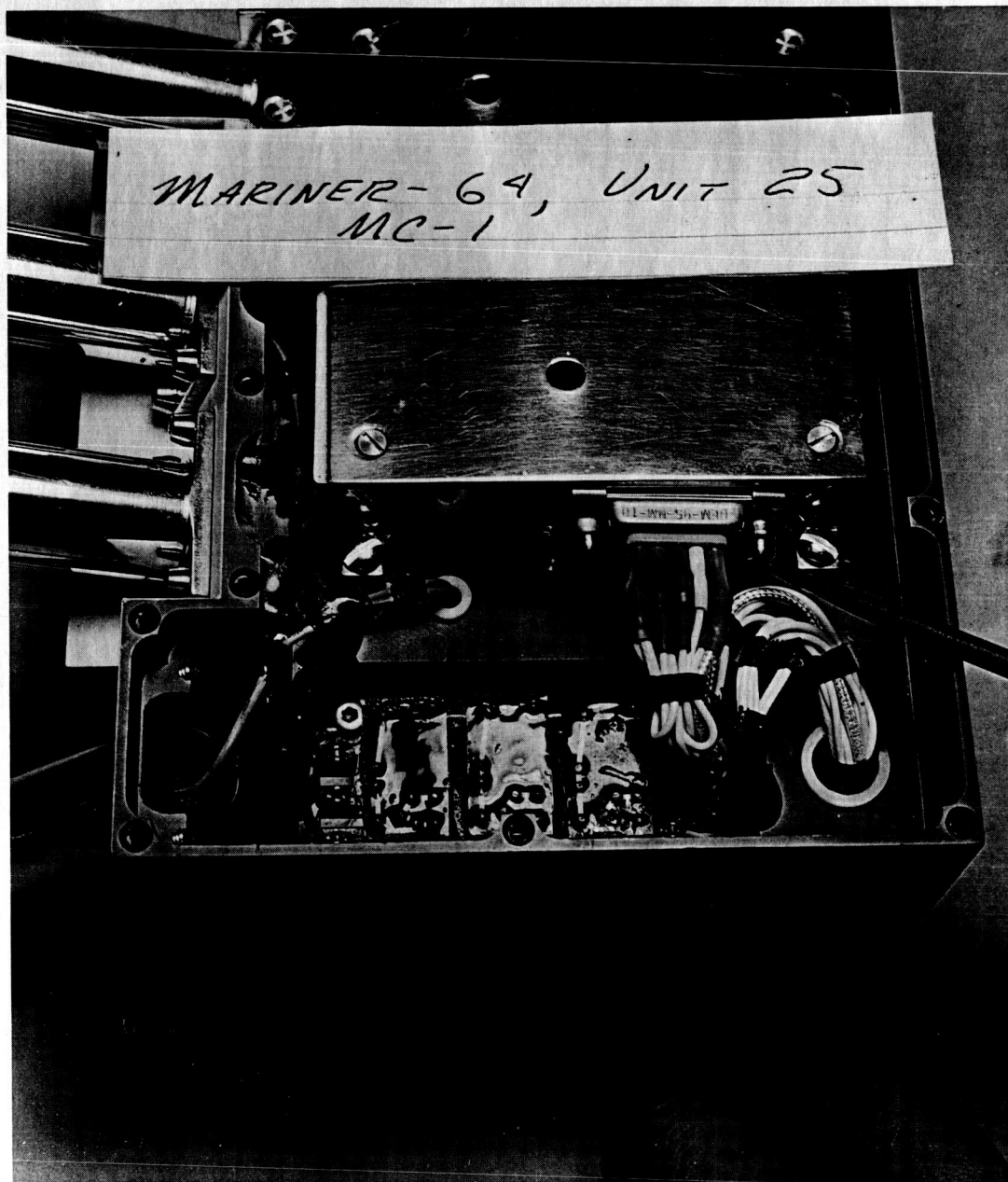


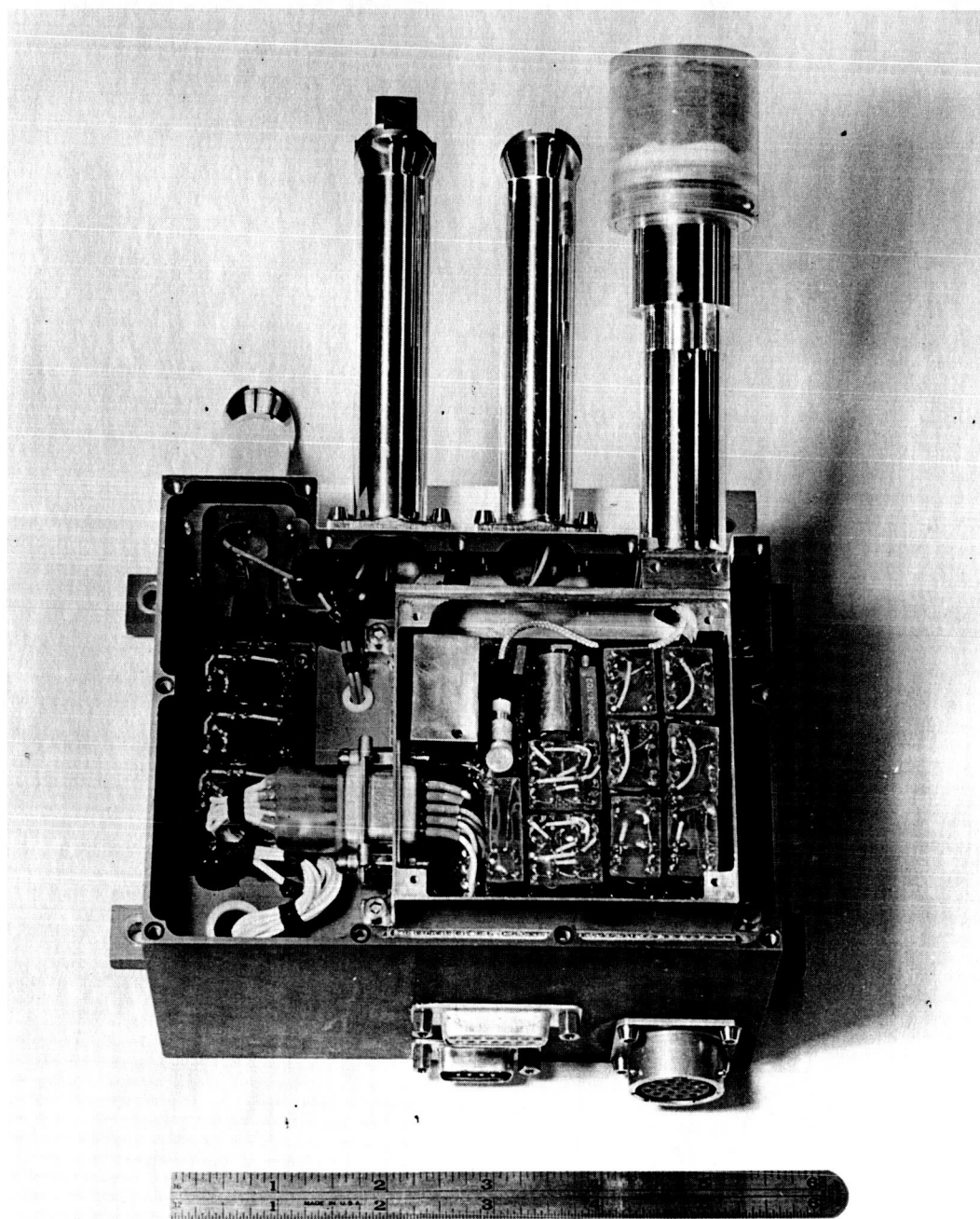






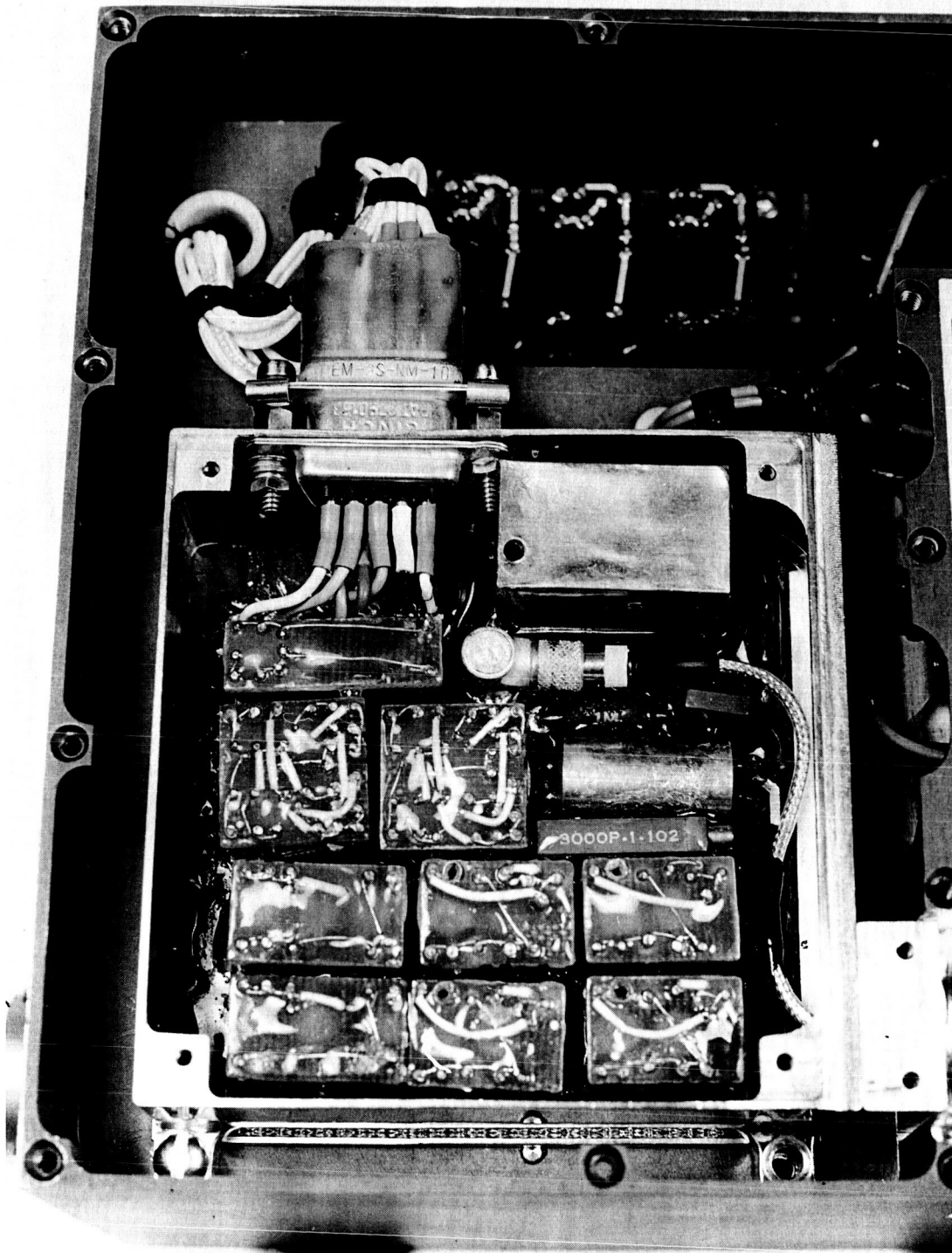
MC-1

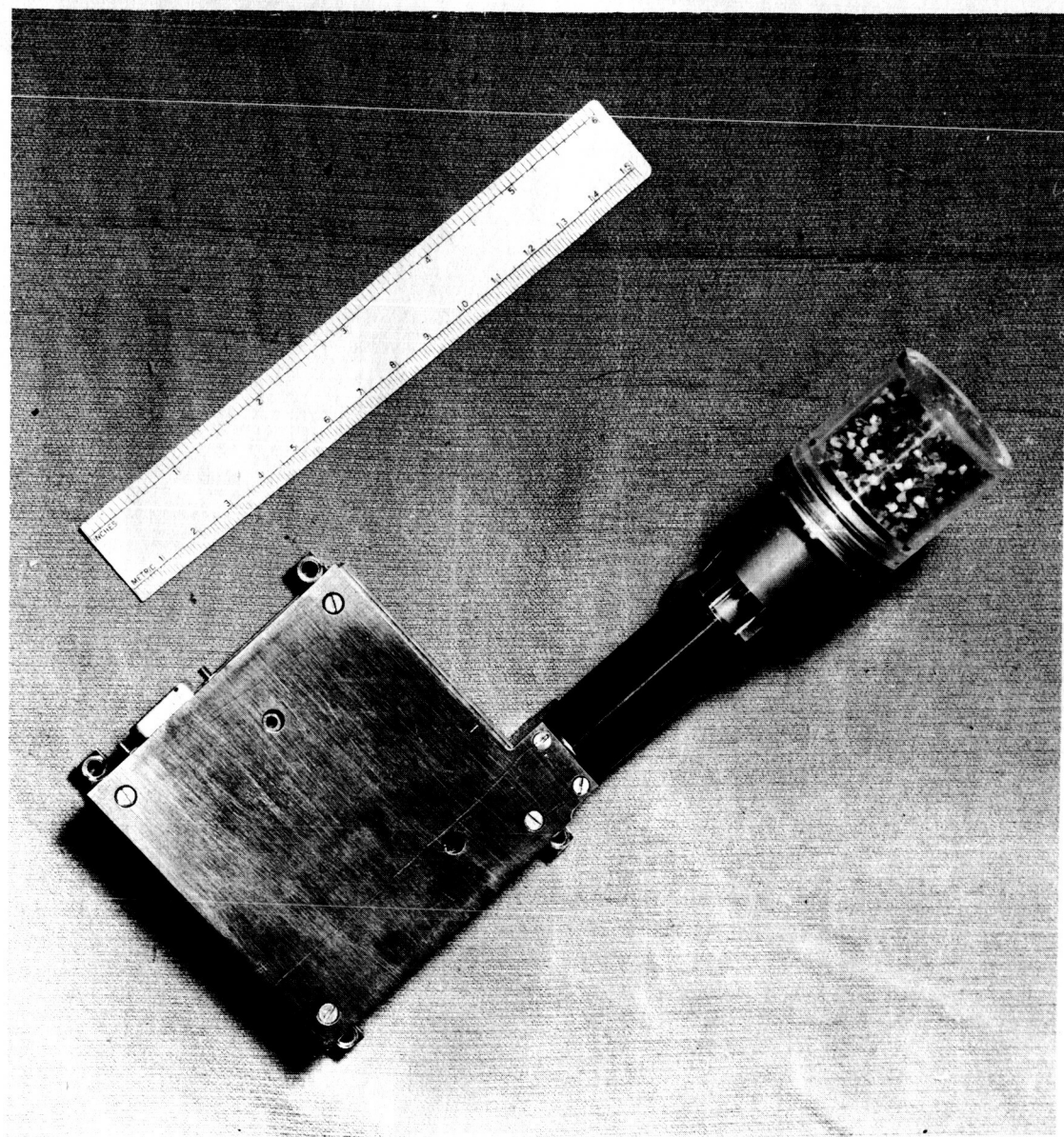


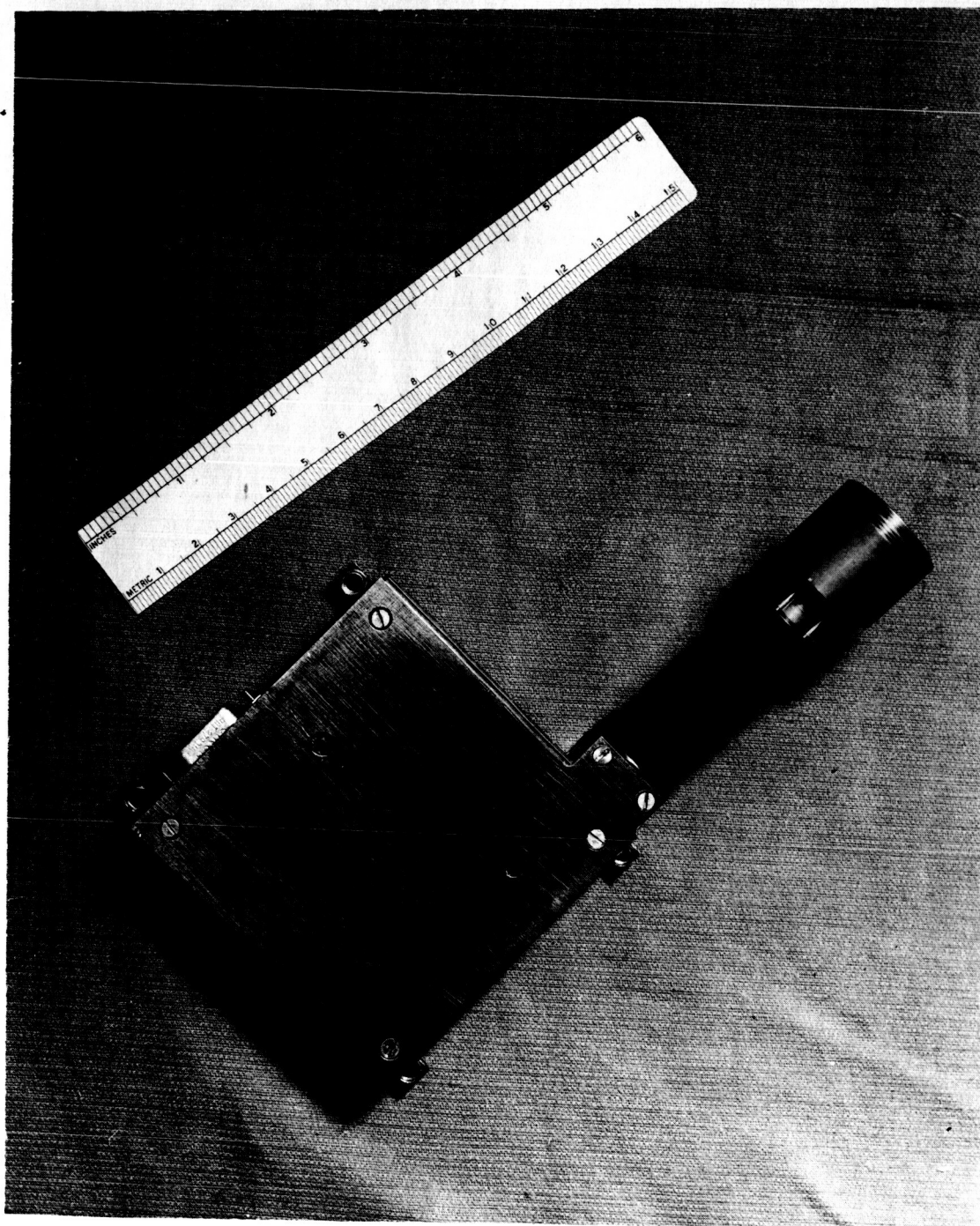


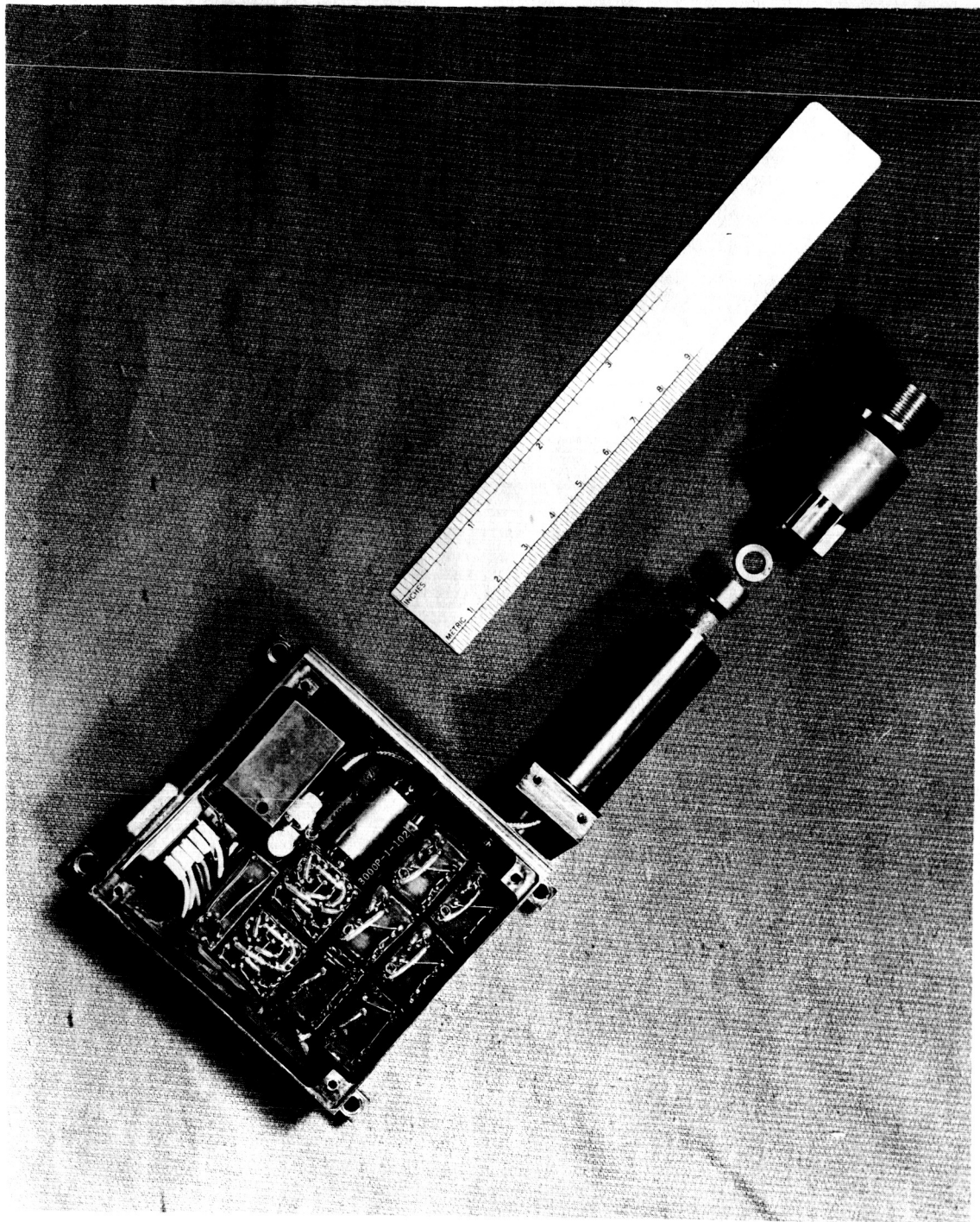
SUI/MARINER C-64

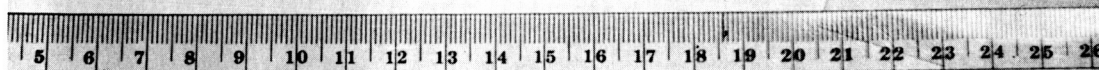
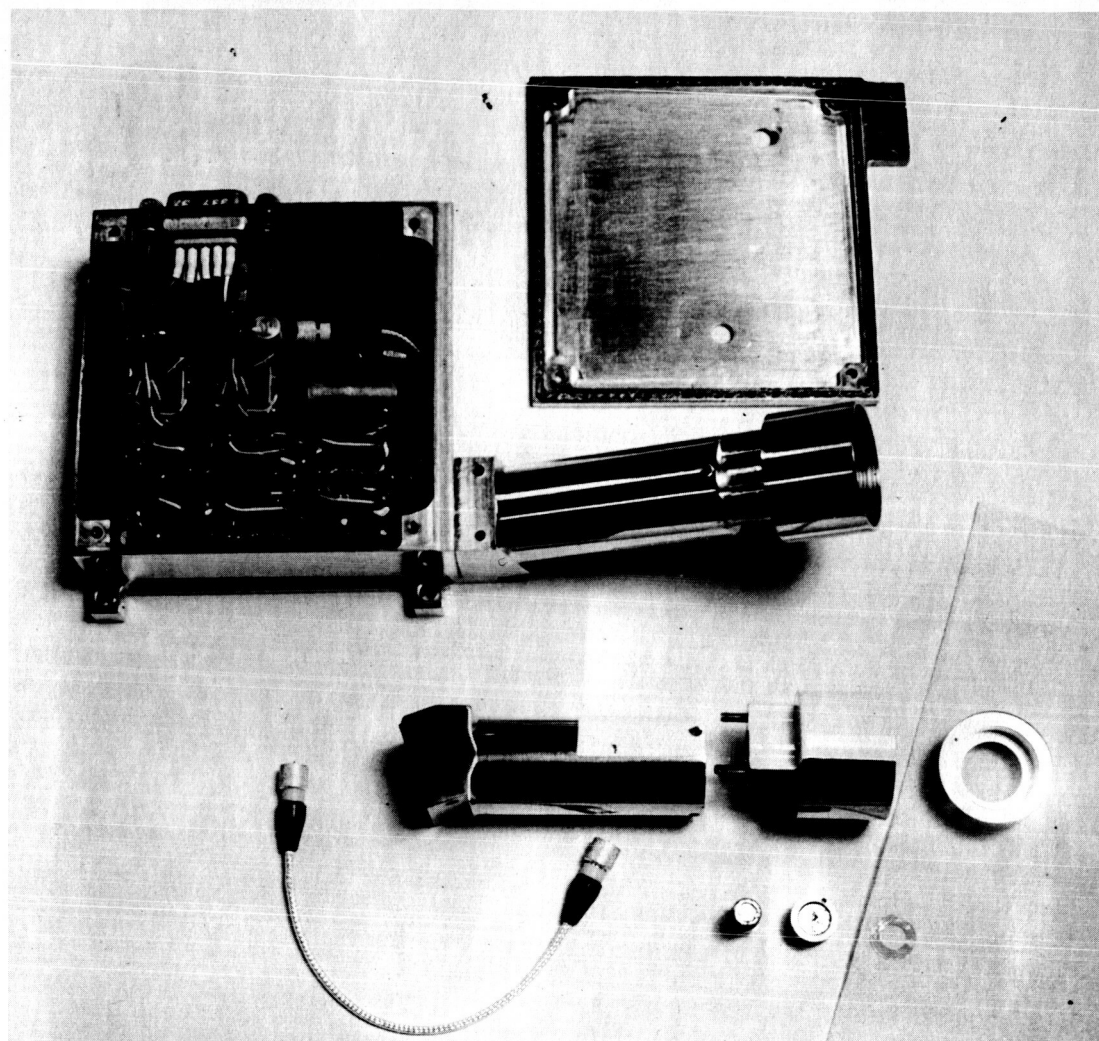
MC-1 EXPERIMENT











SUI MARINER C
SURFACE BARRIER DETECTOR

